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**EFFECTS OF CONTINENTAL GLACIATION ON  
AGRICULTURE\***

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Some reference is made in recent geographical texts to the effects of the Pleistocene continental ice sheets on the industry, commerce and agriculture of those areas of North America and Europe which they invaded.<sup>1</sup> Such passages are in the main confined to broad generalizations. No detailed, comparative summation of the favorable and adverse effects of the former presence of the ice on the human occupation of the glaciated regions is attempted. Limitations of space in view of the breadth and involved nature of the subject are no doubt responsible for the failure of the authors to consider it more fully. Yet the wide areal distribution of phenomena due to glaciation, and the very complexity of relationships these have to modern civilization, invests them with great geographical interest.

In this paper it is attempted to present and analyze only one phase of this broad subject, namely a comparative study of the beneficial and harmful effects of the ice invasions on agriculture.

Agriculture is crop production. The comparative success of agriculture is measured by the amount, character and permanence of crop production. An enumeration and evaluation of the factors

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<sup>1</sup> Bowman, I.: *Forest Physiography*, N. Y., 1911, p. 486 and elsewhere.

Salisbury, R. D.: *Physiography*, N. Y., 1907, pp. 228-289, 316.

Salisbury, Barrows & Tower: *Elements of Geography*, N. Y., 1912, pp. 405-407, etc.

Dryer, C. R.: *High School Geography*, N. Y., 1912, pp. 122, 353.

due to glaciation which make for and against the *optimum* of each of these units, or their sum, will, therefore, express the relative benefit or harm done to agriculture by the invasion of a given region by glacial ice.

#### TOPICS TREATED

Even with the limitation imposed on this paper a wide array of topics needs to be considered. If some of these topics seem to be inadequately treated this may be attributed in part to their number. In the list of topics and sub-topics, given below, relative importance has in some instances been subordinated to convenience and continuity of discussion.

##### 1. GENERAL RELATIONS:

- (a) Geographical Position of the Glaciated Areas with reference to Modern Civilization.
- (b) Comparison of the Agricultural Status of Glaciated Areas with that of Non-Glaciated Areas.
- (c) Climatic and Topographic Position of Glacial Zones of Erosion and Deposition.

##### 2. EFFECTS DUE TO RELIEF CHANGES CAUSED BY GLACIATION:

- (a) Increased Diversity of Relief and its Agricultural Consequences.
- (b) Modification of Relief and its Agricultural Consequences.
- (c) Effects of Relief Changes on Ground Water Conditions as Affecting Agriculture.

##### 3. GLACIAL SOILS:

- (a) Characteristics Distinguishing Glacial Soils from other Soils, and their Agricultural Significance.
- (b) Variation in Age of Glacial Soils with respect to Crop Productivity.
- (c) Textural Variations of Glacial Soils in relation to Diversified Agriculture.

##### 4. EFFECTS ON AGRICULTURE DUE TO HYDROGRAPHIC PHENOMENA RESULTANT FROM GLACIATION:

- (a) Glacial Lakes and their Effects on Local Climates and Agriculture.
- (b) Agricultural Relations of Deposits in Drained and Filled Glacial Lake Basins.

##### 5. SUMMARY.

##### 6. CONCLUSION.

#### 1. GENERAL RELATIONS

(a) *Geographical Position of the Glaciated Areas with reference to Modern Civilization.* Pleistocene continental glaciation was a phenomenon centering essentially about the North Atlantic Basin. Around the North Atlantic Basin are centered, also, the leading nations of the modern world. In the generalized statements of the textbooks, it is sometimes suggested that the leadership of

such nations is largely accruing from natural advantages they have derived from continental glaciation. Without question many of the natural resources of these nations are owing to the invasion of the ice. Whether, however, what has been gained, on the whole, more than balances possible losses due to the ice advances cannot be so readily judged by cursory examination. Geographical factors other than glaciation, moreover, may be determinant in this general grouping of modern, virile peoples around the North Atlantic, and historical considerations may not be wholly set aside. Moreover, it must not be forgotten that France, Italy, New Zealand and Australia, to name examples without the glaciated regions, are also in the van of modern progress.

To put the general effect of glaciation on the comparative advancement of nations to a critical test would be most difficult, as may readily be conceived. Pertinent objections and exceptions could be made against any argument or figures cited to demonstrate either the positive or negative side of so broad a proposition: *i. e.*, that the advanced status of nations within the glaciated areas was or was not due to the effects of the ice invasions. Limitation of the question, however, to the general effect of glaciation on the agricultural status of a country or region makes available certain statistics which, if not conclusive for the broader areas, are nevertheless interesting and, applied to narrower areas, are quite significant.

(b) *Comparison of the Agricultural Status of Glaciated Areas with that of Non-Glaciated Areas.* The percentage of cultivated land of the total area of France, practically unglaciated, may be compared with a similar percentage of cultivated lands in Germany, an adjacent country of which a large part of the total area was glaciated. In 1900 Germany with a total acreage of 133,550,020 acres, had 86,596,830 acres of land under cultivation and in pasture, or nearly 65 per cent. of the whole. France with a total area of 130,799,000 acres had 59,329,593 of these in cultivation and pasture, or nearly 45 per cent. of the total number.<sup>2</sup> The two countries have nearly equal areas, but France has the more genial climate. Despite this climatic advantage of France the figures indicate that Germany has 20 per cent. more of productive land. Also Germany supports nearly a third more population than does France, a fact which is in keeping with the amount of difference in productive land. The excess value of Germany's imports of agricultural products (principally food stuffs) over exports, expressed by a number

<sup>2</sup> *The Statesman's Year Book*, 1911, London. Articles on France and Germany.

is 676; while for France it is 929.<sup>3</sup> Here again Germany clearly has the advantage though she supports a greater population.

While these statistics demonstrate rather conclusively the agricultural superiority of Germany it does not follow that the evident difference in crop productivity of the two countries is due to glaciation. Such a deduction depends on the fundamental assumption that all other factors influencing crop production in the two countries are the same, and this assumption can be only an approximation. For example, the relative fertility of different French soils is in a very large measure dependent on the character of the underlying geological formation from which each has been derived. Whether Germany would have had an equal, greater, or less amount of fertile soil than France, of residual and alluvial derivation, is impossible of determination. Again the proportionate area of highland and lowland in the two countries would need to be considered. Nor does it suffice to offset the agricultural benefit France derives from her more genial climate by the fact that some of the fertile areas of Germany do not owe their fertility to glaciation.

Very recent statistics for the United States make possible a somewhat more accurate comparison, than the foregoing, of the agricultural status of glaciated areas with non-glaciated areas, inasmuch as the figures are more detailed, and as such differences as appear may be ascribed to glaciation with considerable assurance. In the following table appear agricultural statistics for states in the humid agricultural region of the country. On the left are grouped states whose territory lies wholly within the glaciated area; on the right those without the zone of glacial influence.

GLACIATED STATES OF THE EASTERN HUMID REGION OF THE UNITED STATES<sup>4</sup>

NAMES	TOTAL AREA IN 1000'S OF ACRES	AREA IN FARMS IN 1000'S OF ACRES	TOTAL VALUE OF FARM LANDS IN 1000'S OF DOLLARS
Minnesota.....	51,749	27,675	1,019,102
Wisconsin.....	35,364	21,060	911,398
Michigan.....	36,787	18,940	615,258
New York.....	30,498	22,030	707,747
Vermont.....	5,839	4,663	58,385
New Hampshire.....	5,779	3,249	44,519
Maine.....	19,133	6,297	86,481
Massachusetts.....	5,145	2,876	105,532
Rhode Island.....	683	443	15,010
Connecticut.....	3,085	2,185	72,206
Illinois.....	35,867	32,522	3,090,411
Iowa.....	35,575	33,930	2,801,974
	265,504	173,870	9,528,563

Percentage of total area in farms 66 per cent.  
Average value per acre of farm land \$54.00.

<sup>3</sup> Chisholm, G. G.: *Handbook of Commercial Geography*, Eighth Edition, London, 1911, pp. 566-568.

<sup>4</sup> *Agriculture Bulletin*, 13th Census of the U. S., 1910, Bureau of Census, Dept. of Commerce and Labor.

## NON-GLACIATED STATES OF THE EASTERN HUMID REGION OF THE UNITED STATES

NAMES	TOTAL AREA IN 1000'S OF ACRES	AREA IN FARMS IN 1000'S OF ACRES	TOTAL VALUE OF FARM LANDS IN 1000'S OF DOLLARS
Delaware .....	1,258	1,030	34,038
Maryland .....	6,362	5,057	163,452
Virginia .....	25,768	19,406	394,659
North Carolina .....	31,194	22,430	343,165
South Carolina .....	19,517	13,512	268,775
Georgia .....	37,584	26,953	370,353
Florida .....	35,111	5,253	93,738
Alabama .....	32,818	20,732	216,944
Tennessee .....	26,680	20,042	371,416
Kentucky .....	25,716	22,189	484,465
West Virginia .....	15,374	10,026	207,076
Oklahoma .....	44,425	28,859	649,066
Arkansas .....	33,616	17,416	246,021
Mississippi .....	29,672	18,558	254,022
Louisiana .....	29,061	10,439	187,803
	394,156	242,010	4,285,893

Percentage of total area in farms 61.4 per cent.  
Average value per acre of farm land \$18.00 nearly.

While this tabulation shows a nearly equal percentage of total area in farm lands (therefore further justifying the comparison of the regions) it also exhibits a remarkable disparity in average farm land values between the glaciated and non-glaciated areas, the value of the former being three times as great. As glaciation is the most important physiographic factor of difference between the two regions, the difference in values may well be ascribed to its effects. Yet the comparison, like the preceding one, is between extensive regions remote enough from each other to permit of a wide variety of factors being operative in bringing about differences in their agricultural status. Thus their climatic, topographic and geologic structure conditions can not well be correlated. A comparison of smaller glaciated and unglaciated areas, immediately adjacent to each other, will serve, therefore, as a check on the integrity of the deduction that the differences so far found are due to glaciation.

Some 9,000 square miles of territory in southwestern Wisconsin constitute the larger part of the Driftless Area, a region unique in that it was entirely encompassed by the ice advances, but itself shows no traces of ever having been covered by them. The elevation, geological structure and climate of this Driftless Area are in no important respect dissimilar from those of the immediately adjacent glaciated areas. Writing about the contrasts between the glaciated and driftless portions of Wisconsin, Whitbeck<sup>5</sup> says: "In the driftless area only 43 per cent. of the land is improved,

<sup>5</sup> Whitbeck, R. H.: The Glaciated and Driftless Portions of Wisconsin. *Bull. of the Geogr. Soc. of Paia.*, Vol. IX, No. 3, July, 1911, pp. 19-20.

while in the drift covered area 61 per cent. is improved, a difference of 18 per cent." Further: "The value of farms and farm buildings averages nearly 50 per cent. greater per square mile in the drift-covered counties than in the driftless." He summarizes other comparisons he has made, bearing on the relative agricultural status of the contrasted areas as "all clearly in favor of the glaciated region."

Like results are obtained on comparing statistics of adjacent counties in Indiana within and without the glaciated area. Thus the average value of farm lands in Daviess Co., within the glacial area, is \$50-\$75 per acre; while in Martin Co., next east, outside the glaciated area, the average value is \$10-\$25 per acre. Similarly Greene Co., glaciated, shows average values of \$25-\$50 per acre, while Lawrence Co., adjacent, unglaciated, shows \$10-\$25 per acre. Daviess Co. has 90-95 per cent. of its total area in farms, Martin 80-90 per cent.; Greene Co. 90-95 per cent., Lawrence 80-90 per cent.<sup>6</sup> That these relations hold generally, as well as for selected typical counties, is shown especially clearly by a map of Indiana (Fig. 1) on which have been set down the average farm values, per acre, by counties and the extent of the several ice invasions outlined.

While it is quite apparent from these comparisons that, as regards agriculture, the status of the glaciated lands is superior to that of the unglaciated areas, it must not be assumed, as is commonly done, that this is wholly due to differences in soil fertility, nor that only benefits were conferred by glaciation. Moreover, the comparisons so far made have been between non-glaciated regions and regions of glacial deposition, *i. e.*, places where the accumulation of drift was in excess of the erosive effects of the ice. It is, therefore, necessary, before finally adjudging the benefits to agriculture of glaciation to outweigh any damage done by the ice occupation, to consider also, whether, in regions where glacial erosion predominated, the possible injuries done by it may not more than counterbalance the benefits conferred on the areas of drift accumulation.

(c) *Climatic and Topographic Position of Glacial Zones of Erosion and Deposition.* While a few glacialists still question the ability of glacial ice to erode notably deep rock basins, or to reduce considerably the height of summit areas, all students of the subject

<sup>6</sup> Data from: *Agriculture Bulletin*, Indiana, 13th Census of the U. S., 1910, map, p. 2; Leverett, F.: *The Illinois Glacial Lobe*, U. S. Geol. Surv. Monogr. XXXVIII, 1899, Plate VI.

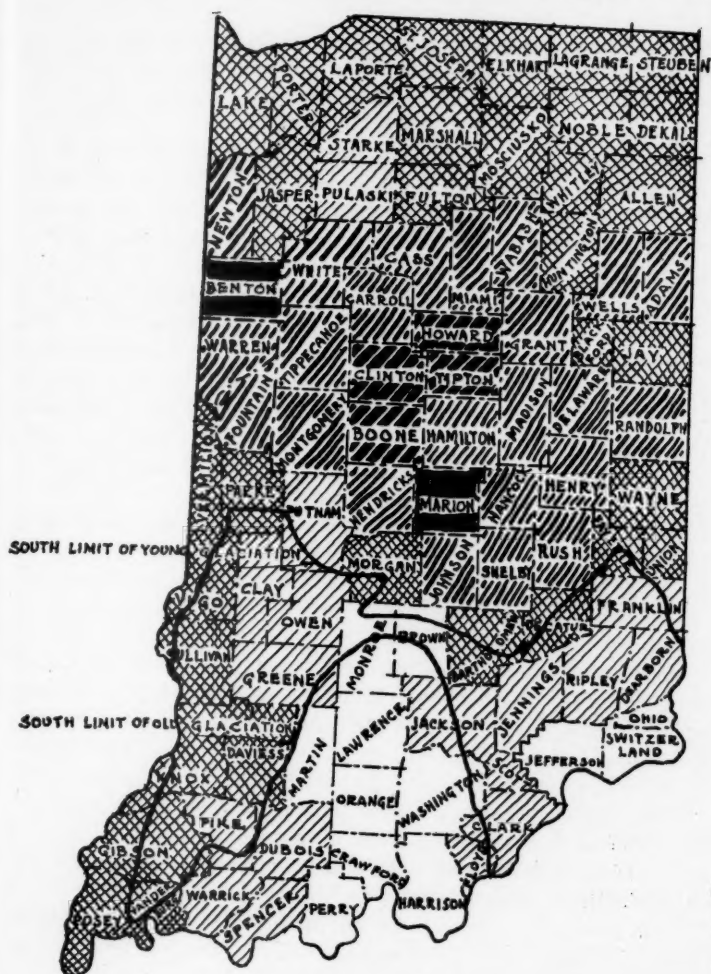
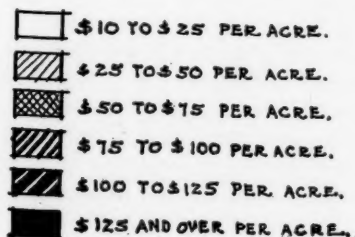


FIG. 1.—Map of Indiana Showing Relative Value of Farm Lands by Counties in Old and Young Glaciated and Non-Glaciated Area, after 1910 Census of the U. S. and Leverett.



are unanimous in conceding the effectiveness of the continental ice sheets in scouring off the cover of residual material and rotted rock which had, in all probability, accumulated in preglacial times over the areas central to the ice dispersion. The result of such ice-scour, in its extreme condition as it occurs in Norway and the northern part of the Scottish Highlands, is typically described by Geikie<sup>7</sup> in a single sentence as follows: "Seen from a height, the ground appears like a billowy sea of cold grey stone." Similar conditions in North America occur in the Laurentian Plateau of Canada of which Bell says<sup>8</sup>: "The Archean country is thoroughly denuded of everything down to the bed rock." Since agriculture is primarily dependent on the existence of a soil cover, and since sufficient time has not elapsed to permit of the renewal, by weathering, of a residual mantle in the postglacial period, there can be no doubt that the agricultural availability of the regions of glacial erosion was seriously impaired by the ice-scour. Moreover, the regions of glacial erosion approach those of drift accumulation in areal extent. If, therefore, only the relative areas of the contrasted regions be considered, the damage done by the removal of the soil cover in the one, might well equal the beneficial effects conferred on the regions where deposition predominated.

It is, therefore, fortunate for mankind, that the regions of glacial erosion are all such as would in any event (except that of a much warmer preglacial climate persisting into the present, if continental glaciation had not occurred) have been unavailable for crop production of a high order. Because of climatic or topographic conditions, or both, the regions of glacial erosion are, in general, unsuited for cultivation. Inasmuch as such factors are independent of glaciation the damage done by the ice in removing the soil cover, in so far as the areas themselves are concerned, is not to be counted either as an agricultural gain or loss.

The general centers of ice accumulation and dispersion (practically coincident with the regions of glacial erosion) are for the greater part situated in comparatively high latitudes. Thus in North America, the Labradorean, Keewatin and Cordilleran centers are all situated in the Boreal or Arctic climatic provinces as characterized by Russell.<sup>9</sup> A leading climatic feature of the Boreal province is its low mean annual temperature—in general from 32°-40° F. Because of this, and especially also because of the shortness of the

<sup>7</sup> Geikie, A.: *Text Book of Geology*, Fourth Ed., 1903, Vol. 2, p. 1309.

<sup>8</sup> Bell, R.: *On Glacial Phenomena in Canada*. *Bull. Geol. Soc. Amer.*, Vol. 1, 1890, p. 295.

<sup>9</sup> Russell, I. C.: *North America*, New York, 1904, pp. 201-202 and Plate III.

growing season, agriculture is of small importance. In the Arctic province the conditions are even more severe. It is interesting to note, further, that the Labradorean center is a plateau with elevations ranging between 500 and 2,000 feet above the sea, and that on the lowlands of the St. Lawrence Valley immediately beyond its southern edge, where climatic conditions favor a higher development of agriculture, is also found the beginning of the regions of drift accumulation. Similarly the Cordilleran center comprises high, steep, mountain areas, topographically unsuited for agriculture; while in the central plains of the continent, where hot continental summers favor agricultural development at higher latitudes than in the upland regions to the west and east, occur also the depositional zones of the marginal areas of the glacial ice moving out from the mountains and from the Keewatin center.

In Europe the glacial centers of ice dispersion of northern Scandinavia, Finland and Lapland occupy even higher latitudes, and though on the Norwegian coast normal climatic conditions due to high latitude are somewhat offset by the modifying influence of the Gulf Stream Drift and its accompanying warm, on-shore winds, the climatic conditions are nevertheless as severe as in the Boreal province of North America. Moreover, the Scandinavian Peninsula on the whole forms a plateau with elevations over 4,000 feet, rising highest on the west coast where otherwise the climatic conditions would be most favorable. Finland and Lapland are notably inhospitable climatic regions lying beyond the general northern limit of agricultural land.

The Scottish Highlands, second in importance, in Europe, as a center of ice dispersion and a region of predominant glacial erosion, lie much farther to the south than the Scandinavian area, but their agricultural importance, excepting the glacial factor, is minimized by the fact that they also are upland areas with average elevations of 1,500 feet above sea level. While the mean annual temperatures of this region are only slightly lower than those of agricultural England, the elevations are sufficiently great to promote a very high rainfall, the annual precipitation being eighty inches and over. This amount is excessive for agriculture, especially since it is distributed rather uniformly throughout the year. Such a climate may be characterized as "raw." The same description applies in the main to the lesser centers of ice erosion in the British Isles; the Southern Uplands of Scotland, the English Lake District, North Wales and the Irish mountains. All of these are highland areas and have a rainfall of sixty inches or over.

In Europe, as in North America, the lowlands immediately adjacent to the highland areas of ice erosion are notably seats of glacial deposition. Here again, also, climatic conditions favor agricultural development. Thus favorable conditions of climate and thick deposits of drift are coincident. In the Lowlands of Scotland for example, "Wide areas of the central counties are covered with it [till] continuously to a depth varying from two or three feet up to one hundred feet and more. But as we follow it towards the mountain regions it becomes thinner and more interrupted."<sup>10</sup> Similarly the agricultural district of southern Norway and Sweden is made up of morainic and outwash deposits,<sup>11</sup> as are also, in large part, the central agricultural plains of Ireland. It may be questioned, indeed, whether the preglacial residual materials of the latter two regions would not have lent themselves better to agricultural pursuits than the boggy conditions and refractory morainic accumulations introduced in these areas by glaciation. However, the general agricultural utility of these lands is largely influenced by climate, and they do not constitute large enough areas in any event to affect, appreciably, previously stated conclusions in regard to the generally favorable effects on agriculture by reason of glacial deposition.

Several minor areas of ice dispersion and erosion in North America still remain to be considered. These are the New England Highlands, the Adirondacks and local areas in the western mountains. While these are all upland areas, in general unsuited, topographically, for agriculture, it is worth noting that in them also the general rule holds that glaciation denuded the slopes and summits, leaving them with only a thin veneer of till in place of their former residual cover, but resulted in a thick deposit of drift in the valley bottoms and lower areas. This relation is discussed in more detail in later paragraphs. Here it need only be stated that the average result was to make the unfavorable agricultural sites more unfavorable, but to improve the favorable ones, probably on the whole a net gain in desirable agricultural lands.

Finally it should be noted that almost the total areas of the regions of glacial erosion are, or were originally, forest lands; and to a forest crop they are climatically and topographically best adapted. Certainly, therefore, glaciation must have left a sufficient nucleus of soil over these areas to make possible the forest growth,

<sup>10</sup> Geikie, James : *The Great Ice Age*, London, 1894, p. 15.

<sup>11</sup> Geikie, A. : *Text Book of Geology*, Fourth Ed., London, 1909, Vol. 2, p. 1332.

if indeed it is not possible, as has been stated, that a forest can grow in soil formed of its own humus.

Summarizing, then, the general relations of agriculture and glaciation, as considered under the three heads above, it is clearly apparent that the total effect of glaciation has been beneficial to agriculture. On the other hand some of the effects of glaciation were detrimental. That the beneficial effects are not wholly due to soil fertility has also been suggested. In this discussion and analysis a consideration of the effects of the various factors due to glaciation, especially as operative in the regions of drift accumulation, is, therefore, next in order.

## 2. EFFECTS DUE TO RELIEF CHANGES CAUSED BY GLACIATION

(a) *Increased Diversity of Relief and its Agricultural Consequences.* Increased diversity of relief due to glaciation may be the result of either ice erosion or depositional accumulations. The effect of ice erosion in accentuating topography is manifested most conspicuously in regions of great diversity of rock structure within narrow areal limits; in places where larger areas and bands of relatively resistant rocks are in immediate juxtaposition with rocks of little resistance to ice erosion; and where the ice sheets invaded regions of rather bold preglacial relief. Morainic ridges and drumlins are the most important forms (from the standpoint of this discussion) of depositional nature which heighten the relief; of minor bearing, because of less frequent occurrence and areal extent, are kames and eskers.

The exposure of a great variety of rocks within small areas is characteristic only of regions of disordered geological structure, namely mountains and districts of worn-down mountains. Within the glaciated areas such regions are found principally in the sections where glacial erosion was predominant, sections which, as has been indicated, are also of little agricultural importance. Thus such great variety of rock structures is found on the Laurentian Highlands of North America, and much of the relief that these have at the present time is due to differential glacial erosion of their diversified bed rock.<sup>12</sup> The same thing is true of the Scottish Highlands where rock basins are extremely plentiful. It is quite certain, also, that some of the inequalities of relief, giving rise particularly to the lake basins, that occur in New England, the Adirondacks, the Lake Superior Highlands and the Lake Region of Finland, are

<sup>12</sup> Bowman, I.: *Forest Physiography*, New York, 1911, pp. 565-566.

of this origin. In the Adirondacks the broader valleys with cultivated bottoms are primarily due to preglacial weathering and "graben" faulting. Of these Kemp<sup>13</sup> says that the bordering "faults and their escarpments were doubtless much freshened by the Labradorean ice sheet, which plucked away from their faces the loose rock, sheeted by the parallel faults. In this way the relief was heightened during the Glacial Period." As figured by Kemp, these scarps are too steep for even forest growth over a large part of the area of their faces. But, as it has been shown that all these regions are in general agriculturally unfit for other reasons than glaciation, there is no need to consider in detail the effect which heightening of their relief by such differential glacial erosion has had on their comparatively small crop production. It will suffice to state that the general result was to give rise to steeper slopes and to that extent introduce an unfavorable condition affecting even the forest growth.

The contact line of igneous rocks and sedimentary strata, or better, where the latter overlap the former is the most important occurrence where glacial erosion has been effective in increasing the diversity of relief due to the juxtaposition of resistant and relatively non-resistant rock formations. The St. Lawrence, Mohawk and Hudson-Champlain depressions, the Great Lakes valleys and the Connecticut Valley are the most conspicuous examples of this kind in the glaciated portions of North America; the Scottish Lowlands in Europe are not of exactly the same type. Although all these areas, and similar occurrences of lesser note were, without doubt, depressions developed in preglacial times, yet Tarr<sup>14</sup>, quoting various authorities, assigns to glacial erosion a part in the carving of each of the Great Lakes, the Hudson-Champlain and the Mohawk valleys. Bowman<sup>15</sup> cites glacial erosion as a factor in the development of the Connecticut Valley. As the St. Lawrence Valley and the Scottish Lowlands were also channels of considerable ice movement, ice-scour was probably influential to some extent in giving them their present topographic expression. However, later glacial deposits largely obscured the effect of this on their bottoms, and, since such depressions were preglacially bordered by escarpment and fault slopes, glacial erosion, in its visible phenomena, probably did no more than steepen these slopes and clear away such

<sup>13</sup> Kemp, J. F.: *Physiography of Adirondacks*, *Pop. Science Monthly*, Vol. LXVIII, March, 1906, p. 203 and Fig. 8.

<sup>14</sup> Tarr, R. S.: *The Physical Geography of New York State*, New York, 1902, pp. 183, 189, 206, 239.

<sup>15</sup> Bowman, I.: *Forest Physiography*, New York, 1911, p. 660.

talus accumulations as may have given rise to a gentle incline from their base to summit. The net result of such action as effecting agriculture would be to enlarge the area of level land at the base of the cliffs.

That this was specifically the case in the Mohawk Valley and that, in addition, glacial erosion may have added considerably to its width of cultivable area is indicated by Brigham<sup>16</sup> who says the valley "continues broad and open toward Little Falls with a concavity of bounding slopes which suggests powerful glacial erosion." As to the probability of effective glacial erosion under such conditions of rock structure Bell<sup>17</sup> says: "When unaltered strata lie at low angles on a nucleus of igneous rock, and the ice moved off the latter against the upturned edge of the stratified rock great erosion has always taken place." The Mohawk valley, in the region referred to by Brigham, constitutes a trench 1,500 feet deep and from twelve to twenty miles wide.

Since the water surfaces of the Great Lakes present unbroken plains, it cannot be strictly held that glacial erosion in carving their basins has increased the diversity of relief. But as so much area has been, by this means, made unavailable for agriculture, the effect of such erosion may well come under this head. Considered from this viewpoint the elimination of the large area of the Great Lakes basins, which were preglacially probably river valley plains, was an important, harmful effect due, in part at least, to glacial erosion. In this connection it is, however, interesting to note that land areas have been reclaimed as well as lost by glacial action. Thus in Europe the Baltic would overflow wide tracts of the plains of Northern Germany if the glacial deposits of that region were removed, for these frequently descend below the level of the sea<sup>18</sup>. Similar encroachment of the sea on the land would occur in England and North America if the present glacial deposits in the valleys were to be removed.

Some of the instances cited above could as well have been referred to as special cases of accentuation of relief, by glacial erosion, of the more general condition where the ice sheets invaded regions of bold preglacial relief. Indeed the effects on agricultural relations under all three of the conditions are very similar. But the most striking development of these effects occurs along the northern

<sup>16</sup> Brigham, A. P.: Topography and Glacial Deposits of the Mohawk Valley, *Bull. Geol. Soc. of Amer.*, Vol. 9, 1898, p. 184.

<sup>17</sup> Bell, Rob.: On Glacial Phenomena in Canada, *Bull. Geol. Soc. of Amer.*, Vol. 1, 1890, p. 296.

<sup>18</sup> Geikie, J.: Ice Sculpture, New York, 1908, p. 244.

and western edge of the Appalachian Plateau in western New York and northwestern Pennsylvania and Ohio. In those regions the ice moved from a comparatively level plains region into a maturely dissected upland, with the result that its main lines of flow were directed by the north-and-south valleys extending parallel to the direction of ice movement; although the ice did overtop the higher elevations in at least the northern part of the district. The heightening of relief by glacial erosion under such conditions of concentration of ice flow, has, perhaps, its most marked expression in the Finger Lakes region of western New York, where it gave rise to what have been termed "through" valleys. Such valleys extend uninterruptedly through from the St. Lawrence to the Susquehanna drainage systems, the former rock divide between them having been cut away by the ice, so that the divides between north-and-south flowing streams are now illy defined and situated on low morainic or other glacial deposits. The walls of such valleys are steep, their sides straight and they show a marked absence of projecting spurs.<sup>19</sup> In some places the steepness is sufficient to make the valley wall a cliff. These valleys have been profoundly modified by glacial erosion, both by deepening and broadening. Not only the main north-and-south valleys, but also the transverse east-and-west valleys show to some extent these effects of ice-scour, and to a less marked degree the tributaries of secondary size reveal the same characteristics. The sides of the valleys are forest-covered, but their broad flat bottoms are all under cultivation. It is clearly apparent that the area of valley agricultural land in this upland region has been increased by the heightening of the relief by glacial erosion.

Glacial erosion, in heightening relief, exerted on general agricultural relations one detrimental effect which, though indirect, deserves mention. It made farm transportation in the eroded plateau district much more difficult. The upland areas are fairly level, and though they are less valuable than the valley lands, they measure a large portion of the area. The trunk transportation lines, the railroads and the markets are in the valleys. The roads from these to the hill farms often need to go straight uphill for from 400 to 800 feet. In some places the grades are so steep as to prevent access to the nearest railroad station. This makes the growing of such bulk crops as potatoes, to which the soils are

<sup>19</sup> Tarr, R. S., Watkins Glen-Catatonk Folio, No. 169, U. S. Geol. Survey, 1909, Field Ed., pp. 16, 18, 21, 218, 223.

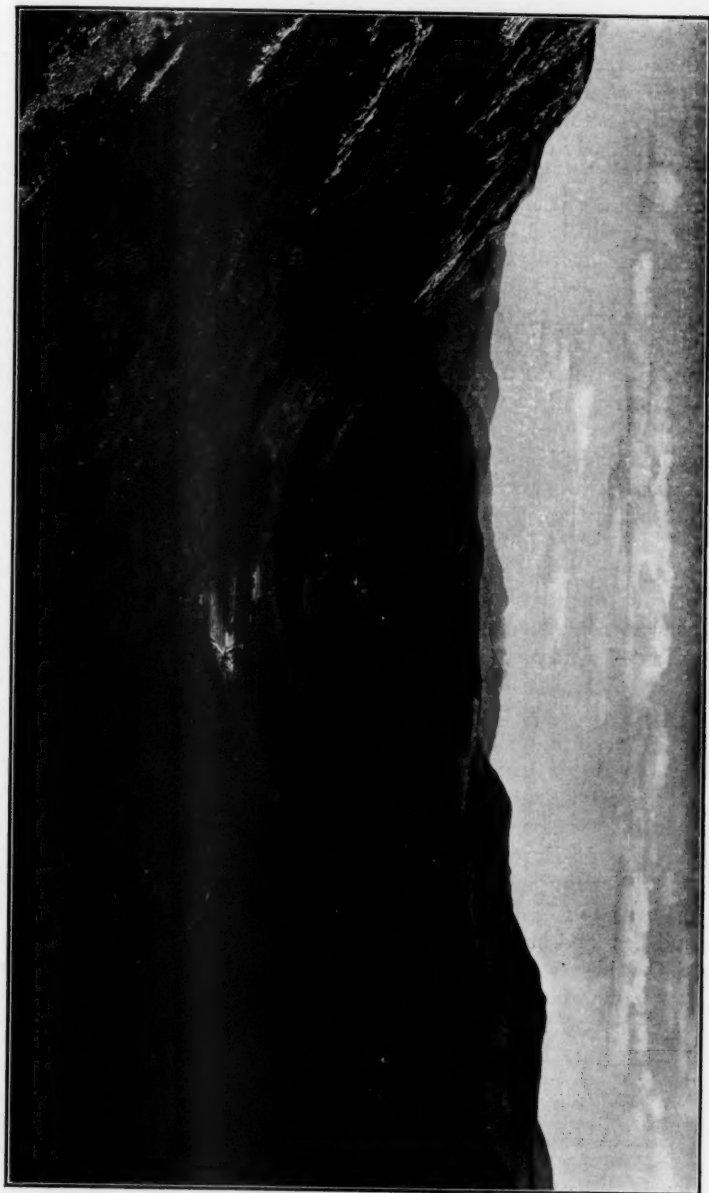


FIG. 2.—Crawford Notch, N. H., from Mt. Willard. Slopes steepened by ice erosion. Photo copyright, 1894, by H. O. Peabody.

adapted, often unprofitable.<sup>20</sup> While not in this plateau section, Crawford Notch (Fig. 2) in New Hampshire illustrates beautifully the character of such ice-eroded and steepened slopes. The valley here was also parallel to the general direction of ice movement, northwest to southeast, as shown by the striations, and no doubt<sup>20a</sup> was similarly carved out by the deeper, main ice currents.

It is perhaps inaccurate to ascribe any *increased* diversity of relief in the glaciated regions to depositional accumulations, because the morainic ridges, drumlins and other forms of glacial deposits that rise above the general level of the land rest, as a rule, on basement deposits of the same origin, of wider areal distribution and of more level topographic expression. These basement deposits mask the underlying rock topography which, under the moraines and other elevated forms of drift deposit, may have had a much stronger relief than these give the land at present. As this, however, is only conjectural while the moraines actually exist, some account must be taken of the effect of their elevations and slopes on agricultural operations.

On the map, Fig. 3, are indicated the positions of the morainic belts and drumlin areas of the eastern agricultural part of North America. This map, however, exaggerates the relief distribution of such forms because the width and continuity of the bands as shown is too great, and because comparatively level lands are included within the tracts delineated as morainic and drumlin areas. While some of the morainic masses rise to heights of 150 to 300 feet and are distributed over zones three, five or even fifteen miles in width, making an exceedingly irregular topography, others are little more than broad, smooth, masses, rounded banks of drift.<sup>21</sup> Drumlins also vary from massive hills 100 to 200 feet high, which may be three or four miles long, to indefinite swells in the drift surface. In Europe, moraines are conspicuously developed only in south Norway and Sweden, on the Baltic Ridge of northern Germany and in Finland and West Russia. Drumlins occur in Ireland and Scotland but only sparingly, if at all, in continental Europe.

Considered as topographic irregularities the occurrence of the larger moraines and drumlins must on the whole be counted as a detriment to agriculture in that their slopes are often too steep

<sup>20</sup> Warren, G. F., and K. C. Livermore: *An Agricultural Survey*. Agri. Exp. Sta. of the College of Agric., Cornell Univ., *Bull.* 295, pp. 437, 458, 560.

<sup>20a</sup> Since this paper was written J. W. Goldthwait in an article, "Glacial Cirques near Mt. Washington," *Amer. Journ. Sci.*, Vol. XXXV, Jan. 1913, p. 12, cites Crawford Notch specifically as a probable example of a glacially steepened "through valley."

<sup>21</sup> Chamberlin, T. C., in Geikie, J.: *The Great Ice Age*, 3rd Ed., London, 1894, p. 741.

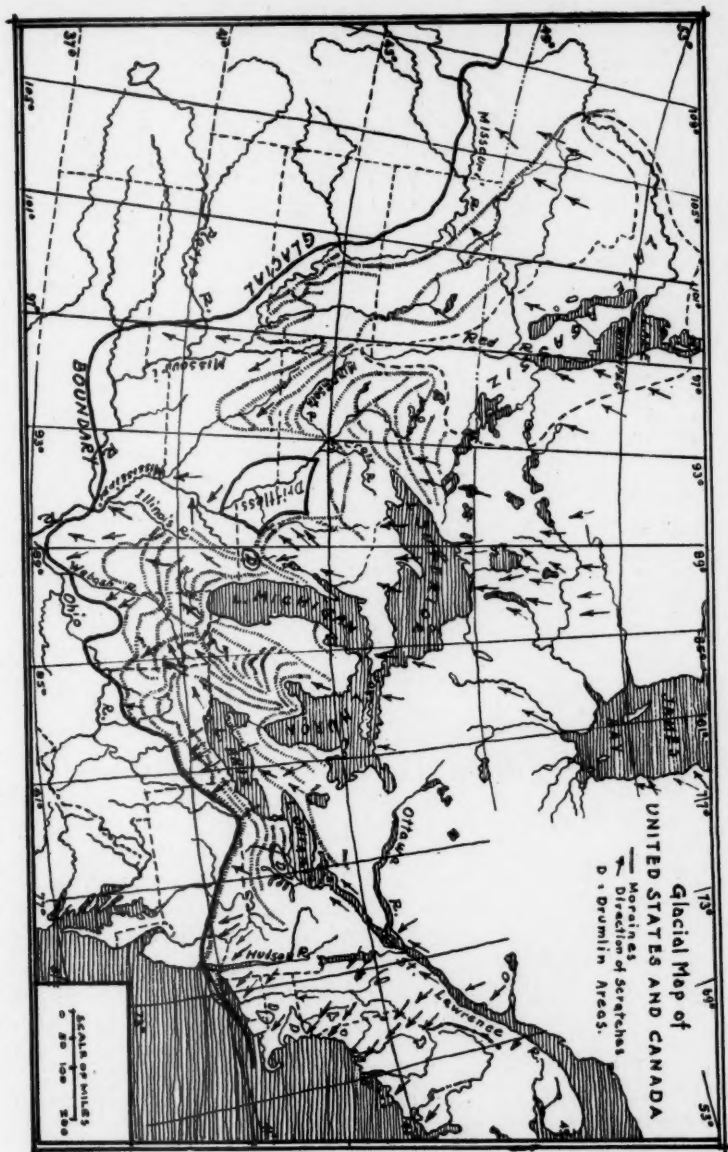


FIG. 3.—Map showing Extent of Glaciation and Distribution of Glacial Phenomena in the United States and Canada. After Dryer.

for cultivation, and in that the irregularities of a well-developed morainic or drumlin zone make it difficult country to bring under the plow. But since the relative area occupied by moraines of such strong expression is small, the loss due to this is probably not great. Where the moraine is developed in broader, lower tracts of thickened drift its slightest slopes often promote good drainage conditions without interfering with tillage operations. Soils on drumlin slopes are usually well drained and in New York are well adapted to fruit trees, especially apples and cherries.<sup>22</sup> On the other hand the depressions of a typical kettle moraine area, low-lying pockets with rims uncut by drainage gaps, are consistently shunned by fruit growers and truck gardeners because they have poor air drainage. The cold, heavier air slides down the slopes and collects at the bottom of such pockets, as they have no outlets at the lower levels.

(b) *Modification of Relief and its Agricultural Consequences.* In the literature descriptive of regional glaciation occur a multitude of references to the effect that the ice invasions resulted in a general reduction of the preglacial relief and that this was accomplished both by glacial erosion and by deposition of drift. In order to understand why this should be the case it is necessary to consider for a moment the nature of the preglacial topography in representative areas and the way in which such topography would be affected by glacial processes.

Processes of weathering, and the erosion of running water, tend to etch the land surface into an intricate relief pattern, bringing into topographical prominence all structural and petrographic differences that may exist in the bed rock of a given region. While the beginning and end stages of a normal cycle of erosion are marked by relief of little expression, it must be remembered that the youthful stage is of very short duration, and that undissected peneplains are practically non-existent in the geological present. Some phase of the middle stage of normal topographic maturity is common on the land surfaces of the globe.

While it cannot be maintained that the preglacial erosion surfaces of the regions invaded by the continental ice sheets had all been developed to a typical stage of maturity in the normal erosion cycle, it is true that the plains areas of both Europe and America that were covered by the glaciation had a much more diversified

<sup>22</sup> Whitney, Milton: Use of Soils East of the Great Plains Region, U. S. Dept. of Agric., Bur. of Soils, *Bull.* 78, p. 106.

topography due to dissection than they now possess. Over the broad interior of North America, a peneplain developed in the Tertiary had been uplifted and dissected to various stages of maturity before the ice invasions of the Pleistocene occurred. In eastern and southern New England, an extensive peneplain, developed in the Cretaceous, was uplifted and much dissected in the Tertiary—in fact again reduced to local peneplains over the areas of less resistant rocks. But a later uplift resulted in the further dissection of the more resistant portions of the Cretaceous peneplain and a redissection of the local early Tertiary peneplains. In Europe a very irregular and disordered rock structure underlies the North German Plain; and the preglacial plains of western Russia probably also had a topography of some diversity due to denudation. Similarly the agricultural plains of central and south-east England, north of the Thames, possessed a diversified topography developed by the action of normal denuding agents on rocks of varying age, resistance, and elevation above sea level.

Nor is it necessary to confine this characterization to plains areas. A multiplicity of minor topographic irregularities, ridges and furrows, is typical as well of the surface of the major relief features of a mountain country, or of the pyramidal masses of a dissected plateau region. As these tend to the old age stage their lines become more flowing; but, as long as they have a significant elevation, variations in structure will make an impress on the topography of their slopes and summits. This would be true of the preglacial Adirondacks, the Catskills, the northern portion of the Appalachian Plateau and the New England members of the Appalachian mountain province. In Europe it would apply to the Southern Uplands of Scotland, the English Lake Region, and the mountains of Wales.

Both the erosional and depositional processes of glacial ice in continental masses are peculiarly adapted to the destruction of just such surface irregularities as it appears must have been characteristic both of the plains areas and the sections with larger relief, now constituting the glaciated regions, preceding the Pleistocene. The action of the ice may best be likened to that of a huge rasp, scouring off the high points and filling the hollows between them with the debris so acquired or, indeed, with that carried from the remoter regions central to the ice dispersion and of predominant erosion. Where the initial relief was great, *i. e.*, in the mountain and plateau regions invaded by the ice, the erosional effect in general was to round off the summit ridges, to replace peaks by dome

forms and to make the valley slopes smooth and regular, eliminating or truncating spurs. If, indeed, the valleys were in some instances greatly deepened and their slopes made steeper, they were at the same time widened and their floors made essentially level by drift deposit on the retreat of the ice. This is true of the valley of the Connecticut in New England, of the Mohawk Valley and the larger valleys of the Adirondacks, of the Catskill Mountain valleys; and applies also to the through valleys in the Appalachian Plateau in New York and western Pennsylvania and to the Appalachian valleys and the Triassic lowland area of northern and western New

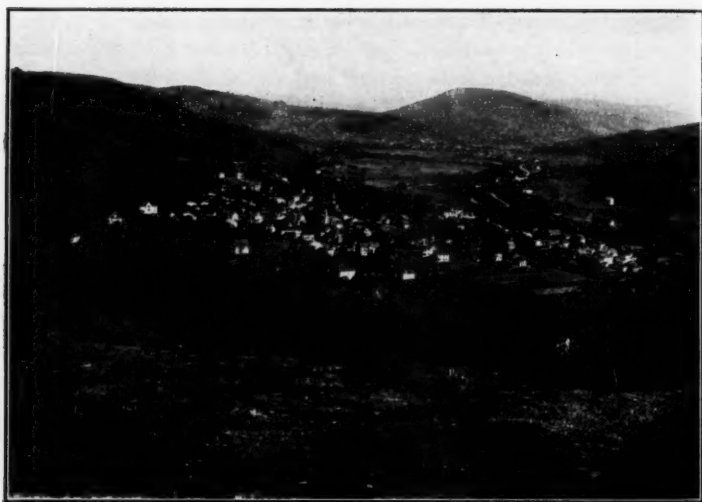


FIG. 4.—Valley of the East Branch of the Delaware River at Margaretville, N.Y. Shows filling and leveling of the valley floor with drift deposits. The valley sides are ice-eroded, showing characteristic striation and grooving at many points, locally.

Jersey. The same set of phenomena are characteristic of the Scottish Lowlands, the Lake District of England and the mountain region of Wales. Photographs of the larger valleys of any of these regions almost invariably illustrate these conditions more or less typically. (Fig. 4.)

Such modification of the relief by glaciation, in regions having topographic units of marked difference in elevation and large mass, was not, however, wholly favorable to agriculture. The slopes and summits of the uplands, which may preglacially have had a deep cover of residual soil, were most attacked by the ice erosion, as they

offered the greatest obstacles to the ice movement. Consequently the residual soil cover and the rotted rock beneath were commonly wholly removed from the exposed areas, and, because of the lobation of the ice on its retreat, glacial deposits in such regions were, by marginal and subglacial streams and moraine accumulation, largely concentrated on the valley bottoms. As a result, glacial deposits are usually found to thin out on the hill slopes and tops, only a thin veneer of rocky till being left behind to cover the glacially eroded, fresh-rock surfaces. The thinness and stoniness of the upland soils due to glaciation must, therefore, be considered as a detrimental effect of glaciation on agriculture. But as this thinning of the soils on the slopes and summits has probably led to a conservation of larger areas to forest than would have been the case if the thicker preglacial soil cover had remained intact and available for cultivation, it may be that the value of the forest and the effect of its cover on the rate of run-off are also very important compensating factors.

The New England region as a whole includes both the mountainous areas to the west and north and the dissected peneplain area to the south and east. Taken together these districts are often cited as typically illustrative of the harmful effects of glaciation on agricultural conditions. It is, therefore, worth while to make special mention of the features of this region in this connection. It has been conjectured that the interstream areas, constituting the uplands of the dissected peneplain, were preglacially blanketed to a considerable depth with residual soil and rotted rock, despite the Tertiary uplift and dissection. All of this weathered material the ice scoured off down to fresh rock, and doubtless it also wore down the elevations and reduced the inequalities of the uplands to some extent, though these are not considered to have been great. In so far, however, it modified the preglacial relief. In the weaker structures of the fresh rock the ice also commonly eroded basins. In the mountainous portions of New England glacial erosion was even more effective and probably sufficed to round off the ridges quite notably, in addition to removing their surface irregularities and covering of weathered material.

On its retreat the ice left only a comparatively thin veneer of soil on the uplands of the peneplain and the slopes and summits of the higher elevations of the mountain country. Moreover, this soil is often very stony, containing from 20 per cent. to 80 per cent. of boulders, some of them quite large. The large size of these erratics is due to the generally massive and durable character of the

fresh bed rock of the region in which the ice was quarrying in its final erosive stages. Such fresh bed rock material, because it was acquired last, naturally formed the bulk of the deposits laid down on the melting away of the ice. In patches on the upland, and quite uniformly in the valley bottoms, thick deposits of finer grained outwash and other glacial materials were accumulated.

Thus it appears that New England was unfavorably affected agriculturally by the glaciation because a large proportion of the preglacial level lands of the region consisted of the interstream upland areas where glacial erosion was most effective and deposition feeble, and the glacial soils left behind consequently thin. In what were probably, in many cases, preglacially, rocky gorge valleys, thick deposits of drift were laid down, and their bottoms accordingly built up, leveled and widened. But these areas comprise a relatively small percentage of the whole region. Moreover, the thin soils of the uplands were cluttered by large boulders because the bed rock of the region was structurally massive and durable, furnishing large fragments to the ice erosion, little susceptible to glacial grinding while in transport.

It is, however, precisely because (in direct contrast to the New England region) the great agricultural areas of both North America and Europe were essentially plains regions, possessing topographic diversity of great detail but of a relatively low order of relief, and regions typically underlain by stratified rocks, thin bedded, much jointed and little resistant, rather than massive and durable, and regions wherein the ridge lands were of lesser area than the low lands, that glacial modification of relief both by erosion and deposition has been so beneficial a factor in determining agricultural conditions. The narrow, little-resistant ridges, were readily worn down. The minor irregularities of the surface were literally submerged in glacial deposits twenty, fifty, one hundred and even five hundred feet thick. The material of these deposits was essentially fine grained, available for tillage, because of the character of the bed rock from which it was derived. Over the extensive areas of the plains the ice spread out in a thick continuous sheet and, on its retreat, confluent outwash and till deposits made great reaches of strikingly level land. This leveling process is possibly the most important glacial factor influencing agriculture. To it, primarily, Whitbeck<sup>23</sup> ascribes the greater agricultural prosperity of the glaciated as contrasted with the driftless portions of Wisconsin:

<sup>23</sup> Whitbeck, R. H.: Contrasts between the Glaciated and Driftless Portions of Wisconsin, *Bull. Geogr. Society of Philadelphia*, Vol. IX, No. 3, July, 1911, p. 19.

"Glacial filling, and to a smaller extent, glacial erosion, have made the drift covered portion of the state smoother than is the driftless region. This has increased the proportion of land that can be tilled." Furthermore, it must not be forgotten that, since the grains constitute the most important staples in the food supply of the world, it is of exceeding consequence to agricultural prosperity that the larger areas of tillable land in any considerable region be suitable for their growth. In this connection the levelness of the glacial plains is a factor of great significance. Altogether it is probable that the reduction in relief brought about by glaciation is the most important of the beneficial effects that have made the ice-invaded regions of greater agricultural value than adjacent lands of similar history, except for this influence.

(c) *Effects of Relief Changes on Ground Water Conditions as Affecting Agriculture.* In the regions of predominant glacial accumulation, which are, as far as the glaciated regions are concerned, coincident with that portion of such areas as are climatically available for agricultural development, the soil mantle is uncommonly thick. Its average depth in northern New Jersey is calculated at between twenty and forty feet. Chamberlin estimates the average thickness of the drift in the Upper Mississippi Basin, in southwestern Ontario and the southern portion of the great northwestern plains of Canada to be 100 feet. Over the general area of the North German Plain Helland found that the glacial deposits averaged 150 feet in thickness. The presence of such deep accumulations of unconsolidated material has an important bearing on the soil moisture and water capacity of the soils of such regions, making both the water supply and its availability to crops much greater. It is true that agricultural regions outside the glacial districts have great thicknesses of residual soil cover, or are made up of great depths of essentially unconsolidated porous material. In regions with a cover of residual material, however, the soil tends to be removed from the slopes by erosion, and under preglacial conditions of topography the soils on the slopes of the Central Plains area of North America were probably comparatively thin. How great the contrast may be is suggested by descriptions of the topography of Indiana in the glaciated area and immediately to the south of it. Thus in the glaciated area: "The valleys begin on the uplands as scarcely perceptible grooves in the compact boulder clay, widen much more rapidly than they deepen, and seldom reach down to rock floor." South of the boundary of the Wisconsin drift

where the country has been little if at all modified by glaciation is found "a region of deep, narrow valleys, sharp irregular divides and precipitous cliffs." "The limit of drift encloses and fits this broken surface as a man's coat fits his shoulders."<sup>24</sup>

The fact that a large part of the Central Plains glaciated area of the United States is underlain by limestone gives additional importance to the present deep filling of glacial drift in connection with water supply and agriculture. As is typically now the case in Kentucky and parts of southern Indiana, these limestone regions probably had a sink hole topography and underground cavern drainage in preglacial times. Under such conditions surface drainage is often practically absent and water supplies from wells are not obtainable. Bowman<sup>25</sup> says: "The Prairie Plains do not have an exceptionally favorable rainfall. There is good reason for believing that were the surface less flat, the absorption of rain water less pronounced, the original forest would have been much more restricted." The thick drift deposits not only furnish unfailing supplies of water for crops and shallow wells throughout the areas of their distribution, but also, under special conditions, large volumes of artesian water, as on Long Island and at Ithaca, New York,<sup>26</sup> often used for irrigation purposes. These relations of the thick drift deposits to water supply conditions must, therefore, be also counted as one of the important favorable influences on agriculture due to glaciation.

<sup>24</sup> Dryer, C. R.: *Studies in Indiana Geography*, Inland Pub. Co., Terre Haute, Ind., 1906, p. 19.

<sup>25</sup> Bowman, I.: *Forest Physiography*, New York, 1911, p. 460.

<sup>26</sup> Tarr, R. S.: *Artesian Well Sections at Ithaca, N. Y.*, *Journ. of Geol.*, 1904, Vol. XII, No. 2, pp. 69-82.

(To be concluded)

## THE ANNUAL VARIATION OF ATMOSPHERIC PRESSURE IN THE UNITED STATES

(STUDIES ON CLIMATE AND CROPS: 6)\*

By HENRYK ARCTOWSKI

The ordinary maps representing the distribution of atmospheric pressure over the globe or over certain parts of the earth's surface give the mean heights of the barometer reduced to 0°C. (32°F.), the sea level and the normal gravity at 45° latitude. The correction to a standard temperature is necessary to avoid the systematic instrumental error due to the expansion of mercury, which is a function of temperature. The correction to the sea level, on the contrary, although necessary for the tracing of maps, is to a certain extent artificial, since, in reality, it leads to a representation of the distribution of atmospheric pressure as it would be if the earth's surface were different from what it is. In the case of continental areas, with extensive plateaus and mountain ranges, as in the west of the United States, for example, the difference may be great for a large number of stations between the corrected sea level pressures and those really observed. By reducing the readings of the barometer to sea level we add to the observed weight of the column of air, above the surface of the ground, the weight of an assumed column of air extending (under the given condition of temperature and vapor tension) beneath the surface of the ground down to sea level. Of course the thickness of the atmosphere above the summit of a mountain is less than at the foot of the mountain; the pressure at the summit is therefore smaller than down below. If we inscribed on a map the observed values we would simply obtain a likely resemblance of the hypsometrical map and such a representation of things would be of no use. But the column of air beneath the surface of the ground does not exist, and, therefore, if for the purposes of our investigations we have to study the transport of air masses,—from one hemisphere to another for example<sup>1</sup>—the unreduced values must be used.

\* For previous papers in this series see *Bull.*, Vol. 42, 1910, pp. 270-282 and 480-495, Vol. 44, 1912, pp. 598-606 and 745-760, and Vol. 45, 1913, pp. 117-131.

<sup>1</sup> Researches on this particular subject have been made long ago by W. Koeppen, J. Kleiber and A. v. Tillö. The most important and more recent papers on the subject are:—O. Baschin: *Zur Frage des jahreszeitlichen Luftaustausches zwischen beiden Hemisphären*, *Zeitschr. der Gesell. für Erdkunde zu Berlin*, Vol. 30, 1895, pp. 368-374;—R. Spitaler: *Die periodischen Luft*

In my former investigations on atmospheric pressure I have shown how important some of the abnormal changes may be.<sup>2</sup> So far I have only taken into consideration yearly means. To study seasonal anomalies, or those concerning a month or two, it was necessary to begin the researches by an investigation of the normal seasonal changes.

The seasonal transport of air masses over continental areas is a complicated phenomenon, and, in my opinion, the knowledge of these complications is of real importance in the study of climatic variations.

Imagine a temporary change in the quantity of energy radiated from the sun, a small variation of the "solar constant" during, let us say, a month of time. The thickness of the atmosphere above high plateaus is less than above low ground or the sea. The reaction of the change must therefore be felt differently at high altitudes than near sea level and a perturbation due to this difference must result. Now, all other conditions remaining the same, as far as may be, the reaction will again be of a quite different character according to the time of the year when it occurs, whether during the summer or the winter months. In summer, temperature being high, the atmosphere is expanded and the proportion of air above high level stations is therefore increased. The results of the observations taken at the summit of Pike's Peak (altitude: 14,111 feet), from 1874 until 1887, may serve as an illustration. The mean barometric height being 17.735 inches, the departures of the mean monthly means from this value are:<sup>3</sup>

January....	-0.263	May.....	+0.028	September..	+0.199
February...	-0.250	June.....	+0.194	October....	+0.065
March.....	-0.194	July.....	+0.323	November..	-0.094
April.....	-0.131	August....	+0.310	December..	-0.181

The curve expressing these figures graphically is extremely regular and represents a simple oscillation, identical to that of the annual

massenverschiebungen und ihr Einfluss auf die Lagenänderung der Erdoberfläche, *Ergänzungsheft zu Petermanns Mitt.* No. 137, Gotha, 1901;—O. Baschin: Die geographische Verteilung des Luftdrucks und deren Aenderung vom Sommer zum Winter, *Zeitschr. der Gesell. für Erdkunde zu Berlin*, 1907, pp. 246-253;—W. Meinardus: Die mutmassliche mittlere Höhe des antarktischen Kontinents, *Petermanns Mitt.*, Vol. 55, 1909, pp. 304-309 and 355-360;—W. Koeppen: Die Verschiebungen der Atmosphäre im Jahreslaufe und die Höhe des antarktischen Kontinents, *Meteorol. Zeitschr.*, 1910, p. 498. The seasonal changes of the distribution of atmospheric pressure in the northern hemisphere, reduced to sea level, may be studied from the maps of monthly normal departures from annual normal pressures published by H. H. C. Dunwoody, (Summary of Internat. Meteor. Observat., Weather Bureau Bull. A., Washington, 1893.)

<sup>2</sup> *Comptes Rendus de l'Acad. des Sciences de Paris*, Vol. 148, 1909, p. 589.

<sup>3</sup> Frank H. Bigelow: Report on the Barometry of the United States, Canada and the West Indies, *Report of the Chief of the Weather Bureau, 1900-1901*, Vol. II., p. 558.

variation of temperature. In January, when the temperature is lowest, the atmospheric pressure is lowest at the summit of Pike's Peak simply because, the air being dense, a smaller amount of air surpasses the elevation of the mountain. In July and August, on the contrary, when the temperature is highest, the air is expanded, it is less dense; a greater proportion of the atmosphere is above the summit of the mountain and this is why the measured weight of air is greater.

It is obvious therefore that in the case of the North American continent, where high plateaus occupy large areas, the seasonal changes in the distribution of the air masses must present local characteristics of some interest.

To begin with, let us compare the curves of the adjoining diagram (Fig. 1) representing the annual variations of atmospheric pressure at some low-level stations along the Atlantic.\* In Washington we notice a simple oscillation of the barometric height: it is lowest during May, June and July and highest in December and January. Going south the curves are more complicated: they show a tendency to adjust themselves to the double oscillation observed in Florida and Cuba, with a principal maximum in January and a less important one in July. Going north from Washington we again notice complications,

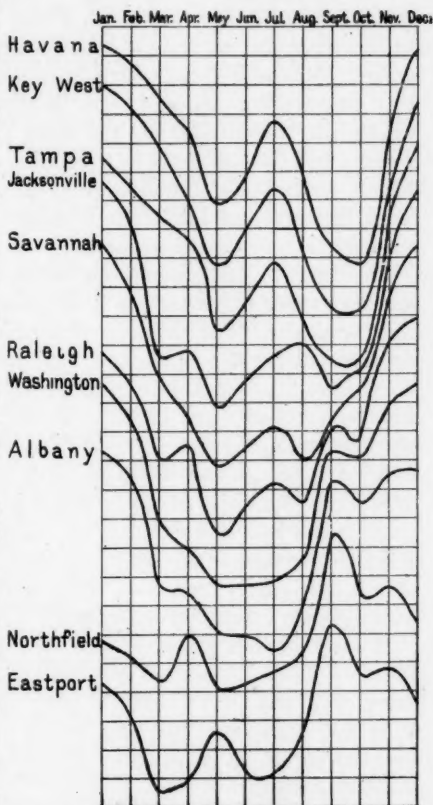


FIG. 1.—Diagram representing the annual variation of atmospheric pressure at stations of low elevation along the Atlantic coast.

\* The monthly means utilized have been taken from the report by Bigelow cited above.

and the curve of Eastport is nearly the reversed curve of Key West.<sup>5</sup>

It is not only along the Atlantic coast that the annual variation presents such distinct types. In Amarillo, Tex., the barometer is below the average from January to June and above from July to December, with the minimum in March and the maximum in July. In Denver, Colo., we observe a simple and regular oscillation; minimum in March, and maximum in August; the same in Salt Lake City where the minimum occurs in May and the maximum in November; in Red Bluff, Cal., the same, but the minimum occurs in August and the maximum in December. Farther north, in Tatoosh Island, in the state of Washington, we see just the contrary: maximum in July and minimum in December, but there the yearly variation is represented no more by a simple oscillation.

In order to understand the correlations between all of these different types of variations it is necessary to study the problem geographically. For this reason I have constructed a number of maps which I will now discuss. The figures utilized to draw these maps have all been taken from the tables designated Table 43 in Bigelow's report (pp. 429-623) giving, besides the results of the observations made from 1873 to 1899, the averages of the monthly and yearly means and the departures. Of course for the majority of stations the series of observations is shorter than the period of years taken into consideration by Bigelow. In many cases, therefore, the departures are far less correct than those where the series of observations is complete. This lack of accuracy, or defect of homogeneity, cannot, however, affect my deductions.

Taking the differences between the highest and lowest departures from the annual mean for each station and inscribing these differences on a map, it was easy to draw the lines of equi-amplitudes. I do not reproduce this map, which represents the geographical distribution of the amplitudes of annual variation, since it can be easily described.

The highest yearly amplitudes occur on the frontier of Mexico. In Yuma, Ariz., the mean departures for January and June are  $+0.166$  and  $-0.141$ , which makes an amplitude of  $0.307$ . In Rio Grande City, Tex., the extreme departures are  $+0.128$  and  $-0.103$ , also occurring in January and June. The disposition of the lines of equi-amplitudes show that four tongues or ridges of high values

<sup>5</sup> The July maximum is subject to interesting variations. The average departure from the yearly mean is  $+0.008$  inches at Key West. The extreme values were observed in 1877 and 1892, when the departures from the corresponding yearly means were  $-0.027$  and  $+0.054$ . The changes in the yearly variation curves, and especially those of the July maximum, seem to demonstrate certain correlations with sun spot frequency.

extend from Mexico, this center of greatest yearly variations, and gradually diminish toward the north. The first ridge follows the Californian valley and goes as far north as Tatoosh Island, Wash. The figures are: Yuma 0.307, Fresno 0.291, Sacramento 0.274, Red Bluff 0.273, Roseburg 0.125 and Tatoosh Isl. 0.131. The second ridge goes northeast from Yuma (Phoenix 0.277) and then turns north (Lander, Wyo., 0.209) and northwest (Boise, Idaho, 0.196). The third ridge starts from Rio Grande City, Tex., and follows the outline of the plateau region along the 97th meridian, as far as the Canadian border line. At Moorhead, Minn., the amplitude is still as high as 0.171. The fourth and least characteristic ridge follows the Atlantic coast and extends from the Gulf of Mexico to Nova Scotia.

Now, between these four ridges, like three fingers coming from the north, we have three characteristic lines of lowest values of the yearly amplitude, increasing from the north toward the south. Between the first and second ridge we note the figures: 0.073, 0.084, 0.135 for Seattle, Wash., Portland, Oreg., and Winnemucca, Nev. Between the second and third ridge we have the following line of lowest values: Havre, Mont., 0.061, Rapid City, S. Dak., 0.082, North Platte, Neb., 0.101, Dodge, Kan., 0.126, Amarillo, Tex., 0.135 and El Paso, Tex., 0.150. And finally from the Great Lakes, where the amplitudes are lowest (Sault Ste. Marie, Mich., 0.071), the values are small along the Appalachians as far south as Atlanta, Ga., where the amplitude is only 0.119.

To summarize therefore: there is a minimum of annual variation in the north and a maximum in the south, and, across the United States, a fork of three depressions of these values extends from the north and a fork of four ridges from the south. Moreover, in all probability a correlation exists with the topographical conditions. The number of barometric stations is insufficient to decide upon this question. Notice now that—evidently—it is along the ridges of greatest annual variation that the air is the most drawn and rejected, periodically, with the changes of the seasons.

I have drawn two other maps which it is also not necessary to reproduce. These maps give the month of occurrence of the yearly maximum and minimum. If the annual variation were represented everywhere by a simple oscillation with one maximum and one minimum, things would be simple. But it is not so. Certain areas have two maxima and two minima, and for some places the variation is even more complicated, so much so that it is difficult to decide. The monthly departures for Seattle may serve as an

example of an unsettled yearly variation:  $-41, +17, -38, +32, -10, +22, +22, -27, -24, +20, -3, +27$ . These figures are the means of only seven years of observations. But the comparison of the figures for these different years shows that the yearly variation is not settled one way or the other.

I will now consider the geographical distribution of the maxima. Their earliest appearance is in the plateau region: in July at Helena, Mont., and Amarillo, Tex.; in August at Lander, Cheyenne, Denver and Pueblo; in September at Santa Fé and Rapid City; in October at Havre, Mont.; in November all around and enclosing the preceding area, at Spokane, Walla Walla, Boise, Salt Lake City, Flagstaff (a secondary maximum) and, on the other side, at Dodge, North Platte and Williston, N. Dak.

It is of interest to notice that the early appearance of the maximum is not a simple question of altitude. The El Paso station is 3,762 feet above sea level, and the variation is regular and simple: a maximum in December, followed by a gradual decrease until May, and, from then on until the end of the year, the increase is progressive; there is no secondary maximum or minimum. In Phoenix, Ariz., only 1,108 feet high, the July maximum is slightly marked, the figures for June, July and August being  $-127, -83, -89$ . This secondary maximum in July is well marked on the annual variation curves of other stations: Baker City, Winnemucca, Carson City, and, on the other side, Dodge and Pierre, for example. But the principal maximum occurs in December.

The December maximum is characteristic for California and also for the margin of the plateaus at Phoenix, Ariz., El Paso, San Antonio and Abilene, Tex., and farther north, towards the northeast of Kansas, and from the Gulf of Mexico on both sides of the Appalachians as far north as Pittsburg, Pa. South and north of this December area the maximum occurs in January at San Diego, Cal., Galveston, Tex., and in Louisiana, Florida and Georgia. The same occurs farther south in Havana, whereas in Santiago de Cuba and Porto Rico the maximum occurs in February. East of the Missouri River, especially in Minnesota, Iowa and Illinois, the maximum of the yearly variation occurs in January; also on the Atlantic coast and in the intermediate region of the Great Lakes. Farther north, in Boston, Portland and Eastport, we note a perfectly characteristic maximum in September and but a secondary maximum in January. Finally, in Marquette, Escanaba and Alpena the maximum occurs in February and in Sault Ste. Marie as late as April. The secondary July maximum of Key West and other southern stations

occurs in August in Jacksonville, and farther north and west many stations display a secondary maximum in September, the month of the principal maximum of the Lake region.

The map giving the occurrence of the yearly minima is also of some interest. The earliest occurrence of the minimum is in March. The area where the lowest values fall in March forms a strip crossing the plateau region from Helena, Mont., towards Amarillo, Tex. The other stations with a well-pronounced March minimum are Baker City, Lander, Cheyenne, Denver, Pueblo and Santa Fe. But in Carson City the principal minimum also occurs in March; and at the stations in Oregon and Washington, where the annual variation is more complicated, the month of March forms one of the minima.

Around the March area we have a few stations where the minimum occurs in April: Flagstaff, Ariz., and North Platte, Neb.; for example. In Salt Lake City the barometer is lowest in May, also in Winnemucca, Nev., and San Diego de Obispo, Cal.; but there we have a second minimum in August. This August minimum is to a certain extent characteristic for California, Fresno with a July minimum and San Diego, where the minimum occurs as late as September, forming the exceptions.

South, north and east of the area where the minimum occurs in March we have a great predominance of stations with a May minimum. In North Dakota, Minnesota and Wisconsin the minimum occurs in June, and in the northeastern states, where the annual variation is more complicated, July forms one of the minima. A double oscillation is also very well developed in the southern states, and if we look more attentively at the details we note that this double oscillation can to a certain extent be explained as follows: A first minimum propagates itself from the West Indies towards the north across the Atlantic states, and from the Rocky Mountains towards the Lakes and Canada. The second minimum is this same minimum coming back from the north towards the south.

Going north we may cite: April minimum over Porto Rico and the southern part of Cuba, Florida and all of the Middle States with an extension towards the Lakes and the Atlantic coast as far as Norfolk; June minimum at some of the New England stations, the northwestern states cited above and Canada: going back south: July minimum over New York, Pennsylvania and New Jersey; in August a secondary minimum well pronounced towards the south; in September the principal minimum at Jacksonville and Tampa; in October at Jupiter and Havana; and, finally, in November over

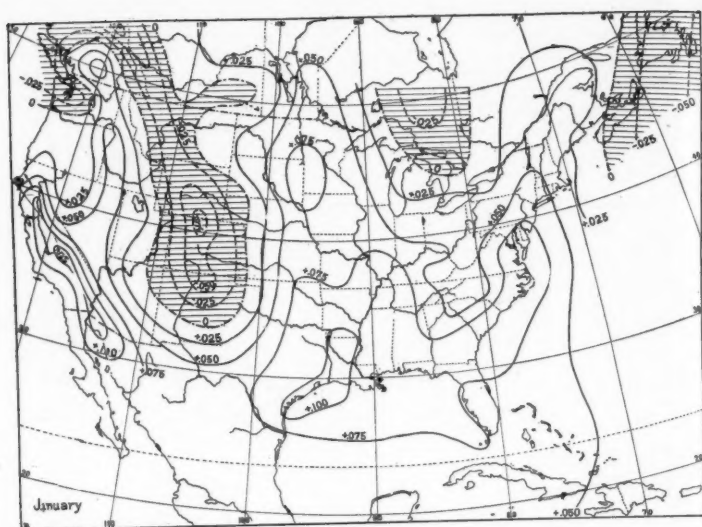


FIG. 2

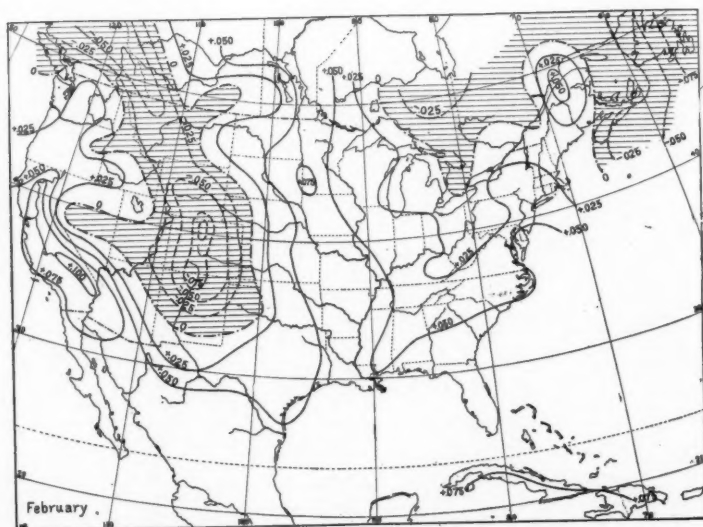


FIG. 3

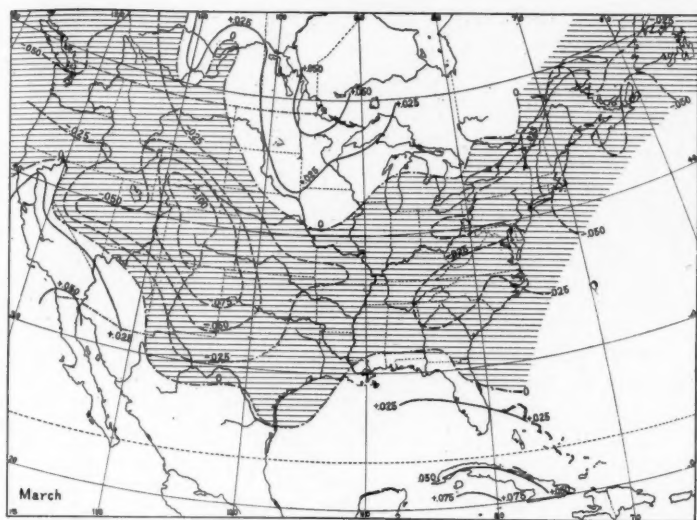


FIG. 4

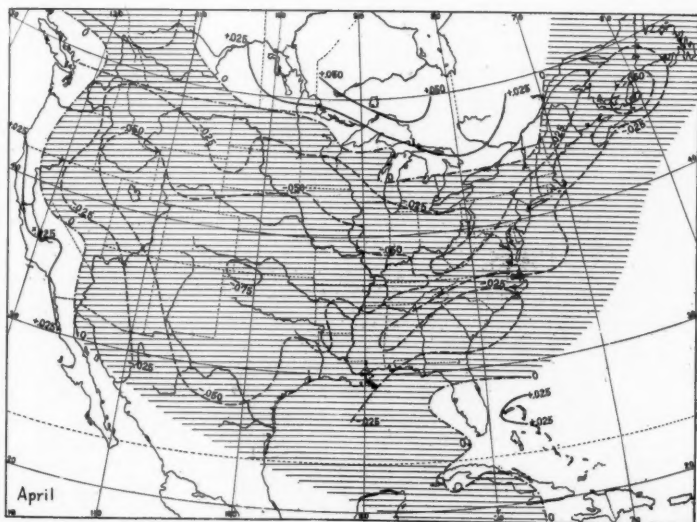


FIG. 5

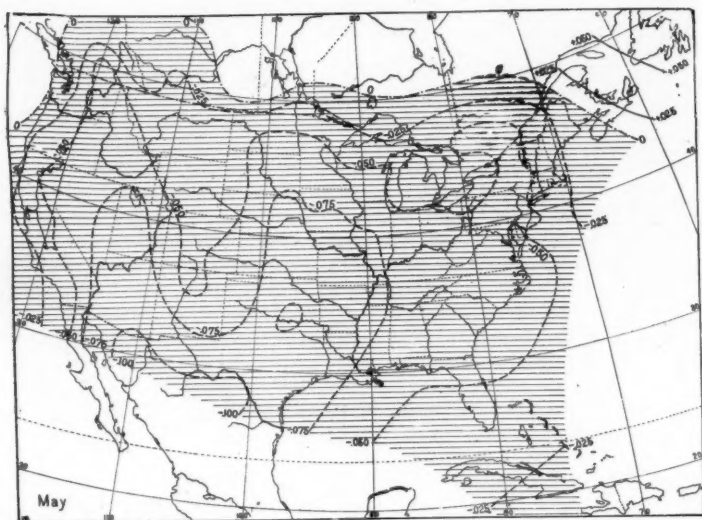


FIG. 6

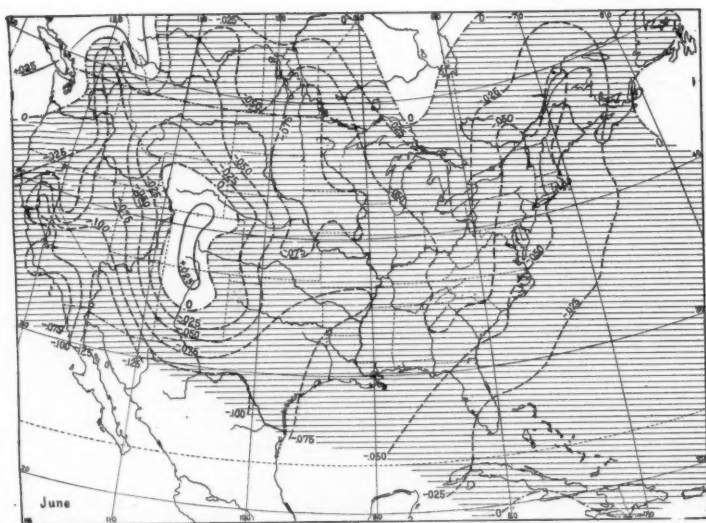


FIG. 7

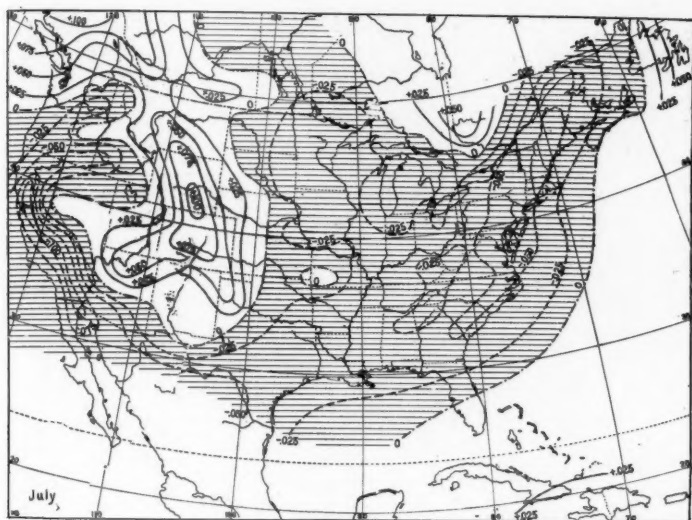


FIG. 8

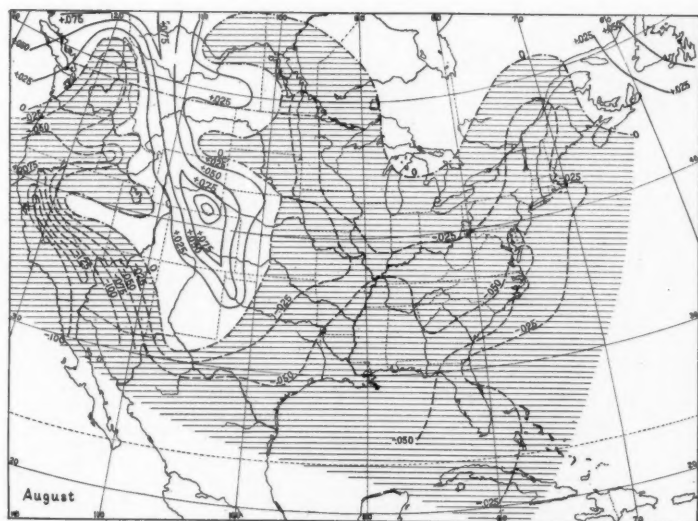


FIG. 9

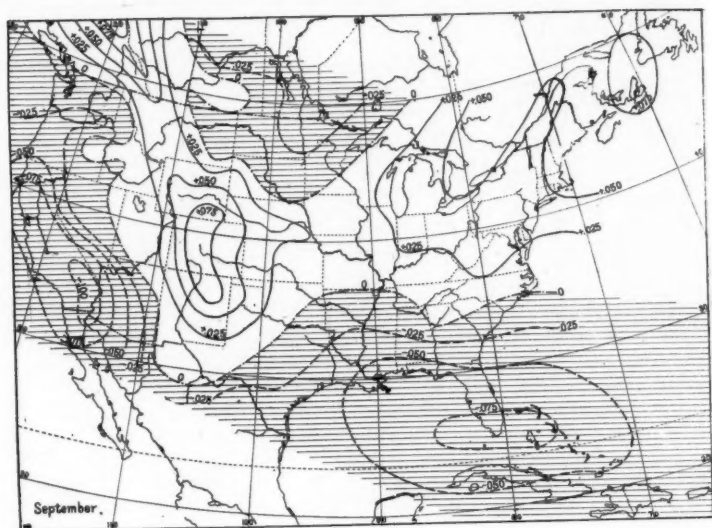
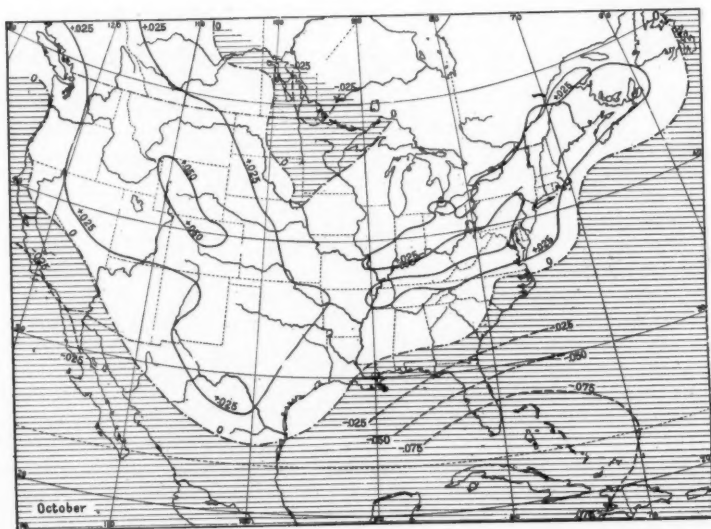


FIG. 10



**FIG. 11**

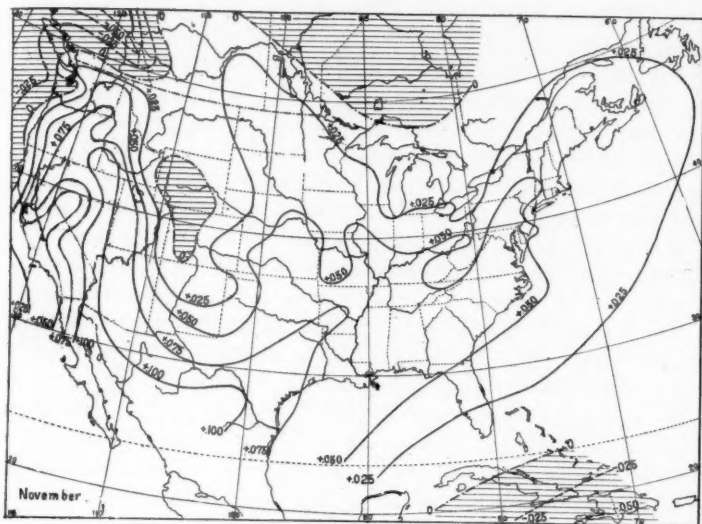


FIG. 12

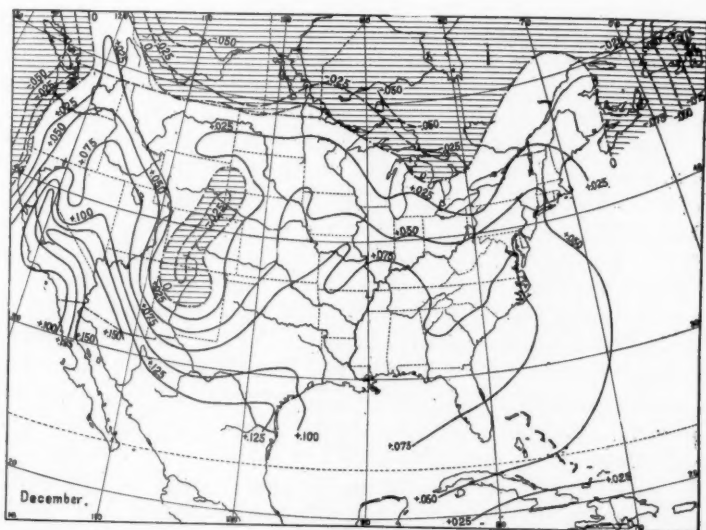


FIG. 13

Porto Rico. Therefore it is a wave movement to and fro, a seasonal migration.

In order to study this migration I have drawn maps of the departures of the mean monthly means from the normal atmospheric pressure (Figs. 2 to 13). On the maps the equi-departure lines are drawn for every 0.025 of an inch. The positive areas indicate the excess of pressure above the normal annual mean and the shaded negative areas the deficit below the normal. These maps represent therefore the real transport of the air masses quantitatively.

The comparison of the maps naturally leads to many remarks. I will mention but a few points which are of more general interest.

As I pointed out before, the minimum of the yearly variation occurs in January at the summit of Pike's Peak. At the stations of the plateau region where the annual minimum occurs earliest it is only in March that we observe it. Now why is this so? The maps explain the fact. In January, when the temperature is lowest, the area of negative values at the plateau stations is due, exactly as at the summit of Pike's Peak, to the greater density of the air: in other words the air has to flow down the slopes in order to be maintained in equilibrium, while on both sides, east and west, the pressure is much above the normal. In February the pressure decreases and in March it is below the normal. The base on which the layers of air repose on the plateau has gone down, and the decrease of pressure below causes the March minimum above. In reality the minimum occurs in January; it is retarded till March mechanically.

Now, why does the yearly minimum migrate as I have shown? The maps will give us an answer. From the maps I have prepared cross-sections along a straight line from Sault Ste. Marie to San Luis Obispo. The following diagram (Fig. 14) gives the sections for the months from January to June. First of all we see that the difference between the depression and the ridges is greatest in January and diminishes until May. We also see at once why it is that the lowest value is observed in March. But in place of the occurrence of this minimum we notice in May and June the formation and development of a maximum. Referring to the maps we find that this maximum occurs in August. On the section there is a shifting of the minimum in April. In May we have two minima. In June the growing maximum shifts these minima farther apart, one to the northeast and the other to the southwest. The March minimum of the plateaus, which is a mechanically retarded January mountain minimum, has therefore a marked influence on the

occurrence of the annual minimum in the surrounding region. The minimum has to migrate; the maximum also. The sections for the months from August to December (not published here) show this very well.

The maps measured with a planimeter could serve to estimate the quantities of air which are displaced one way or another month by month. At least one figure is of great general interest. It is the figure expressing the weight of the total mass of air going from and coming back over the area of the United States, the difference between the mean values of the months of highest and lowest atmospheric pressure.

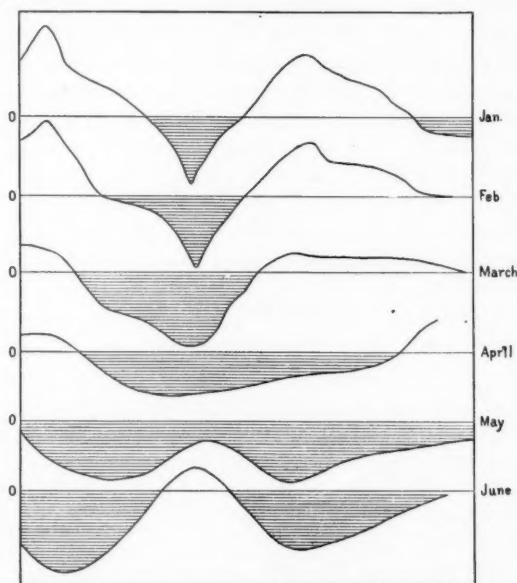


FIG. 14—Cross-sections along a line from Sault Ste. Marie, Mich., to San Luis Obispo, Cal., showing the mean monthly departures from the normal atmospheric pressure (indicated by the 0 line) from January to June. Based on Figs. 2 to 7.

As planimetric measurements require more time than I can afford on this particular question—which interests me but indirectly—I have simply taken the figures from Table 54 in Bigelow's report. Bigelow calculated the mean departures of the ten groups of stations and then computed the means. The extreme means are  $+0.045$ , in December, and  $-0.044$ , in May. The differ-

ence in the pressure over the United States between May and December is therefore 0.089. This figure is too small inasmuch as Bigelow's groups of stations cover unequal areas. Nevertheless let us imagine a difference of 0.090 inches (or 2.3 mm.) of mercury. The weight of one cubic centimeter of mercury being 13.5956 gr.,<sup>6</sup> the weight of a column 2.3 mm. high is 3.126988 gr. per square centimeter. In other words the difference in atmospheric pressure between the months of December and May is equivalent to the weight of a column of water at least 3 centimeters high. This amounts to 30,000 (metric) tons per square kilometer or 235,181,-490,000 tons for the surface area of the United States.<sup>7</sup>

It is this weight of air (equivalent to the weight of 235 cubic kilometers of water) which periodically moves away and comes back. The maps show the details of the displacements.

Let us consider the monthly distribution of pressure along the 90th meridian. The cross-sections for the months from August to December show that the high pressure area moves from north to south. In August pressure is above the normal on Lake Superior; in September the crest of the positive wave is near Dubuque, in October it is over St. Louis, in November at Memphis and in December at New Orleans. From August to December the positive departures at the crest increase and at the same time cover a progressively wider area. The surplus of air which makes this wave comes, as the maps show very well, from the northeast and the southwest. There is a double movement of the air masses: the air necessary to increase the pressure comes first from the northeast, the Atlantic, then from the southwest, the Pacific Ocean west of Mexico, and this is probably the reason why the crest has to move from north to south along the 90th meridian.

There are many minor phenomena of this same kind for which a careful study gives an easy explanation. Studied from another point of view, especially in connection with the data on wind and rainfall, I think the maps would give information relating to the study of crops. The data I utilized to draw the maps were averages. In the case of particular years the departures may be very different from what they are on the average.

In these Studies on Climate and Crops I will have to come back to the investigation of the annual variation of atmospheric pressure and examine the subject from the point of view of abnormal con-

<sup>6</sup> Smithsonian Geographical Tables, 1906.

<sup>7</sup> According to the Statistical Abstract the surface area of the United States is 3,026,789 square miles.

ditions existing in particular years. As an example I will cite the differences of the mean yearly pressures observed at Cheyenne and San Francisco. The smallest figures are those of 1878 and 1889, years of minima of sunspots. The largest difference occurs in 1893, a year of maximum of sunspots. One may ask in what particulars the annual variation of atmospheric pressure in 1893 was different from the average.

As we have seen, the annual ebb and flow of the atmosphere over the North American continent is a phenomenon far less complicated than it seemed to be. We may hope therefore that it will not be too difficult to discern the superposition of abnormal waves, due to the variations of solar activity, upon the normal waves due to the changes of the seasons.

DOBBS FERRY, N. Y., June 23, 1912.

### SCOTT'S LAST EXPEDITION: A REVIEW\*

By WILLIAM HERBERT HOBBS

Eight years ago, after the return of Scott's first expedition, appeared "The Voyage of the 'Discovery'" in two large volumes. This was followed in 1910 by the report of the British expedition under Lieut., now Sir Ernest Shackleton, likewise in two volumes of similar size entitled "The Heart of the Antarctic." The two new volumes which describe Scott's second and last expedition maintain the form and the general external appearance of their predecessors, though surpassing them—as they do, indeed, all other reports of similar purpose—in the perfection and the beauty of their illustrations.

Taken together these six volumes of narrative and scientific observation are without a rival and should be the cause of just pride for every compatriot of the great leaders, Scott and Shackleton.

\*Scott's Last Expedition: Vol. I Being the Journals of Captain R. F. Scott (xxiv and 446 pp.); Vol. II Being the Reports of the Journeys and the Scientific Work Undertaken by Dr. E. A. Wilson and the Surviving Members of the Expedition (xvi and 376 pp.) Maps, ill., index. Arranged by Leonard Huxley with a preface by Sir Clements R. Markham. Dodd, Mead & Co., New York, 1913. \$10.00. 9½ x 6½.

The heroic endeavors and the tragic fate of Scott and his companions, Wilson, Oates, Bowers and Evans, are already known to everyone; and the full story of their fateful polar journey was awaited as has been no other report in the long history of exploration. In advance of the appearance of the work in English, the rights of translation of this story were secured for a great number of foreign languages.

Volume I, which is devoted exclusively to the diary of Captain Scott, has wisely been left by the editor with little change, even though the parts which precede the eventful polar journey are somewhat diffuse and would probably have been considerably revised by their author before publication. The diary of the polar journey confirms, it must be frankly admitted, the impression that the expedition was not only peculiarly marked by untoward circumstances, such as the unusually inclement summer and the early break of the succeeding winter, but quite as much by a persistent belief, in the face of much evidence to the contrary, that ponies are superior to dogs as traction animals on polar journeys. Whatever may have been the views in the past, the comparative logs of the Amundsen and Scott polar journeys, having all due regard to differences in weather conditions encountered, have definitely settled this question. How the English polar party met each succeeding reverse without complaint, and how they struggled on to their almost certain fate, is told in the simple and modest language of a truly great man and explorer. The wrestling from them of the prize for which they had struggled took the heart out of the party and must have meant a distinct loss of speed upon the homeward journey. It is much more than probable that this disheartenment lost them at least the eleven miles which were necessary to reach the One Ton Depot in advance of the great blizzard which finally wrecked the expedition. A few lines from the diary tell the story:

"Jan. 16 . . . The worst has happened; or nearly the worst. We marched well in the morning and covered  $7\frac{1}{2}$  miles. Noon sight showed us in Lat.  $89^{\circ} 42'$  S., and we started off in high spirits in the afternoon, feeling that tomorrow would see us at our destination. About the second hour of the March Bowers' sharp eyes detected what we thought was a cairn; he was uneasy about it, but argued that it must be a sastrugus. Half an hour later he detected a black speck ahead. Soon we knew that this could not be a natural snow feature. We marched on, found that it was a black flag tied to a sledge bearer; nearby the remains of a camp; sledge tracks and ski tracks going and coming and the clear trace of dogs' paws—

many dogs. This told us the whole story. The Norwegians had forestalled us and are first at the Pole. It is a terrible disappointment, and I am very sorry for my loyal companions. Many thoughts come and much discussion have we had. Tomorrow we must march on to the Pole and then hasten home with all the speed we can compass. All the day dreams must go; it will be a wearisome return" (pp. 373-374).

Nowhere in the diary is there a suggestion that the "butting in" of the Norwegians at the last moment upon territory which the unwritten traditions of exploration had preempted for the British expedition until their attempt had been made, was other than entirely sportsmanlike. Whatever their feelings, the members of the expedition, and the British nation as well, have maintained a most discreet and praiseworthy attitude.

Scott's diary indicates that he was apprehensive lest the cairns and depots which had been set up along the course might be missed upon the return; and the difficulties encountered during the earlier stages served only to increase his anxiety. The remarkably keen vision of Lieut. Bowers more than once saved the party, sometimes after the cairn had been passed. Amundsen's more elaborate precautions of setting up transverse series of snow cairns at frequent intervals along the route would thus appear to be necessary to insure safety on such journeys over a featuresless plain subject to violent storms.

The death of Captain Scott having left us with no summary report upon the polar journey, we must perforce cull the isolated scientific observations from his narrative of toil and hardship, and the greatest interest naturally centers upon the vicinity of the pole which has only once before been entered. Amundsen's sojourn south of lat. 89° S. had indicated it to be an area of light and variable winds and generally good weather, in contrast to the strong southerly winds which descend the ice slope toward the margins of the plateau area. It is thus interesting to find that Scott's observations made about a month later led him to similar and independent conclusions. He reports that the sky in the near-polar region was often overcast, and that the clouds "don't seem to come from anywhere, form and disperse without visible reason. The meteorological conditions seem to point to an area of variable light winds." During much of the time fine snow crystals were falling but with the sun not obscured. The fallen snow is not compacted, but is soft "as deep as you like to dig down." A similar observation to this was made by Amundsen. Farther out

toward the margin of the inland ice the earlier observations have indicated a distinct stratification of the snow with thin hard crusts separating thicker layers of soft material.

Upon the return journey a halt was made to examine the mountain rampart at the upper end of the Beardmore Glacier outlet, and specimens of coal containing distinct plant impressions were secured from the Beacon sandstone formation. At the special request of Dr. Wilson, these specimens were not abandoned even when every pound of burden caused delay in what became a race for life against cold and starvation. These fossils should fix the geological age of the great sandstone formation of the region, but as yet they have not been reported upon.

Volume II includes reports upon various sub-expeditions, beginning with that of Wilson, Bowers and Cherry-Garrard made in the midst of winter to the penguin rookery at Cape Crozier, in order to secure eggs during the breeding season and, upon embryological grounds, to learn the relationship of the emperor penguins. In view of the severe weather encountered this was one of the hardest sledging journeys upon record. It lasted for five weeks and for much of the time air temperatures were below  $-50^{\circ}$  F. with a minimum of  $-77^{\circ}$  F. There follows the report of Lieut. Campbell upon the Northern Expedition which wintered at Cape Adare, and, unexpectedly, owing to a failure of the *Terra Nova* to take off the party, a second winter was passed in an igloo near the foot of the Reeves Glacier on the western shore of the Ross Sea. The party suffered great hardships, being compelled to subsist in their snow cave upon seal and penguin for the most part. In the spring they rescued themselves by a sledge journey across the sea ice to headquarters at Cape Evans.

Two expeditions to the westward of McMurdo Sound and Ross Sea were made under the direction of Mr. Griffith Taylor, the chief geologist of the expedition; by the use of theodolite and plane table an excellent map was prepared to replace the reconnaissance map made by Ferrar of the earlier Scott expedition. This map is undoubtedly the most accurate and satisfactory of any that has yet been prepared in the Antarctic. A number of new glaciers are described, and valuable glaciological and physiographical data were secured and are discussed by Taylor and Debenham in special sections of the volume. Special studies of ice physics were made by Wright, and extended meteorological data were collected by Simpson. A summary of biological work carried out on board the *Terra Nova* is supplied by Lillie.

Dr. Simpson, the meteorologist of the expedition, upon the basis of his observations has reached the conclusion that the blizzards which are so severe at Cape Evans and along the route of the polar party, are local and restricted to the western margin of the Great Ross Barrier. His explanation, sketched in outline only, is that the refrigeration of the air by the Ross Barrier produces an area of high pressure above it, and that this air tending to flow northward toward the area of lower pressure lying over the Ross Sea, is deflected westward in consequence of earth rotation and so made to pass northward over McMurdo Sound where it meets the mountain ranges in Victoria Land. In the opinion of the reviewer this theory fails to take account of the severe blizzards encountered by the Shackleton party (and by the Scott party as well) upon the ice plateau, the proven centrifugal distribution of winds about this plateau, and the change of wind direction at the British winter stations during the progress of a blizzard.

In conclusion one is tempted to mention again the exceptional beauty of the illustrations in these two volumes, largely to be ascribed to the remarkable skill of Mr. Herbert G. Ponting, the photographer of the expedition.

## GEOGRAPHICAL RECORD

### THE AMERICAN GEOGRAPHICAL SOCIETY

**The Society's Exhibitions.** Public interest in the exhibitions at the Society's house give ample encouragement to continue this feature of our work. The attendance during the first ten weeks of this year was 2,817 and would doubtless have been much larger if it had not been for the long period of inclement weather. On March 15, the first pleasant Sunday in six weeks, there were nearly 500 visitors. The exhibition has recently consisted of many views of conspicuous types of the vegetation of the world published by Gustav Fischer, Jena, a series of large views showing types of the physical forms of the earth, and a collection of superior etchings, presented to the Society by Vice-President Anton A. Raven, illustrating historic public buildings, houses and scenes in the early days of our history as a nation. A part of the space in the exhibition hall is given to maps relating to the Spanish and Portuguese lands in the new and old world simultaneously with the exhibition, at the Hispanic Society of America, of photographs, books, etc., covering the same regions.

The exhibition in our house will be suspended on Friday and Saturday, April 3 and 4, as the room will be needed for the meeting of the Association of American Geographers.

**Meetings of the Society.** A regular meeting of the Society was held at the Engineering Societies' Building, No. 29 West 39th Street, on Tuesday evening, February 24, 1914; Vice-President Greenough in the chair. The following persons, 22 in number, recommended by the Council, were elected to Fellowship:

David Gibbs, Meriden, Conn.,  
Edward Cummings Harts-  
horne, Englewood, N. J.,  
Miss Mary A. Armour, Kan-  
sas City, Mo.,  
John Russell Clarke, Elmira,  
N. Y.,  
Benjamin G. Brawley, At-  
lanta, Ga.,  
Miss Juliette A. Owen, St.  
Joseph, Mo.,  
Lucius F. Donohoe, Bayonne,  
N. J.,  
Roland B. Dixon, Cambridge,  
Mass.,

Alfred J. Henry, Washington, D. C.,  
James F. Chamberlain, Pasadena,  
Cal.,  
Otto Holstein, Guayaquil, Ecuador;  
and, of this city:  
William Harmon Black,  
Gutzon Borglum,  
Mortimer N. Buckner,  
Henry Kelly Brent,  
Frederic Coerr,  
Stuart Crockett,  
Burdett P. Craig,  
Miss Katherine L. Cammann,  
Mrs. Sophia Klein,  
Jerome Kingsbury,

Max Mayer.

Mr. James W. Erwin of San Francisco then addressed the Society on "Hawaii: Our Mid-Pacific Outpost." Besides many lantern illustrations the lecturer showed a considerable number of very effective moving pictures.

A special inter-monthly meeting was held on Thursday evening, March 12, 1914, when Mrs. Henshaw, Honorary Secretary of the Canadian Alpine Club, gave a lecture upon "A New Alpine Area in British Columbia," illustrated by lantern views.

### NORTH AMERICA

**The Trend of Geographical Study in Our Country.** Professor Isaiah Bowman read a paper at the meeting of the Association of American Geographers in Princeton last winter on the topics dealt with in the papers read before the Association between its first meeting in 1904 and its last meeting three months ago. He said that the first meetings (1904-1906) were

naturally marked by a large number of physiographic papers. Then came a period (1907-1910) when physiography and anthropogeography were alternately ahead. In the last three programmes previous to the latest meeting, anthropogeography led, owing chiefly to the growing number of students devoted to the life side of the science. At the Princeton meeting an increasingly large proportion of the total papers dealt with various phases of human geography. Future programmes will probably show a still stronger tendency in this direction, judging by the animated discussions evoked by the more strictly geographical papers.

**Flood Sufferers.** Destitute refugees to the number of 272,752, and 54,525 head of live stock were cared for during the Mississippi floods of April-July, 1912, according to the report of Major J. E. Normoyle (*Flood Sufferers in the Mississippi and Ohio Valleys, Doc. No. 1,453, House of Repr., 62d Congress, 3d Session, Washington, 1913*). The relief cost the Government about \$1,000,000. The report details the daily events during the great flood and gives a good idea of the distress caused by the breaking of the levees. It is similar in style to many Government reports, however, which means that the only way to get information from it is by patient plodding through innumerable telegrams, many of which are of no value whatever.

ROBERT M. BROWN.

**Lightning and Forest Fires in the United States.** Foresters and meteorologists are indebted to the late Fred G. Plummer, Geographer of the Forest Service, for his excellent and thorough study of "Lightning in Relation to Forest Fires" (*Forest Service Bulletin III, 1912, pp. 39*). The part played by lightning in causing forest fires has lately come to be recognized as of great importance. Observations in our National Forests show that it ranks second only to sparks from locomotives as a source of conflagration. Mr. Plummer collected and sorted all existing data relating to lightning and trees. He secured observations from our National Forests and carried on laboratory experiments. Observations of the number of fires caused by lightning in the United States, the kinds of trees most often struck, and the proportion of those struck which ignite have been made by nearly 3,000 forest officers over a territory of nearly 200,000,000 acres. The general conclusions reached by Mr. Plummer were:

1. Trees are the objects most often struck by lightning because: (a) They are the most numerous of all objects; (b) as a part of the ground they extend upward and shorten the distance to a cloud; (c) their spreading branches in the air and spreading roots in the ground present the ideal form for conducting an electrical discharge to the earth.
2. Any kind of tree is likely to be struck by lightning.
3. The greatest number struck in any locality will be of the dominant species.
4. The likelihood of a tree being struck by lightning is increased: (a) If it is taller than surrounding trees; (b) if it is isolated; (c) if it is upon high ground; (d) if it is well (deeply) rooted; (e) if it is the best conductor at the moment of flash; that is, if temporary conditions, such as being wet by rain, transform it for the time from a poor conductor to a good one.
5. Lightning may bring about a forest fire by igniting the tree itself, or the humus at its base. Most forest fires caused by lightning probably start at the humus.

R. DEC. WARD.

**Oil Production of Mexico.** Mexico now holds third place in the list of oil-producing countries. Its annual output amounts to about 18,000,000 barrels, and is exceeded only by that of the United States and Russia. The exports for 1913 will probably amount to 17,000,000 barrels (*Daily Consular and Trade Reports, Oct. 11, 1913*). Mexican oil is much used for fuel purposes. At Manchester, England, tanks for the storage of over 8,500,000 gallons of Mexican oil have been provided. The liquid fuel is distributed by tank cars to plants in Lancashire, Cheshire and the Midland counties. It is also sold to oil-burning vessels. During 1913 a considerable quantity was delivered at

Batum for the account of the Transcaucasian State Railways Company. The Mexican oil fields extend along the entire Atlantic coast. They have been best developed near Tampico and Coatzacoalcas. LEON DOMINIAN.

#### SOUTH AMERICA

**Determining Longitudes by Wireless Telegraphy.** Commander H. A. Edwards of the Bolivian section of the Brazil-Bolivia Boundary Survey wrote from the river Abuna, Bolivia, on Nov. 25, that it had been found possible to carry longitude by means of wireless telegraphy right into the heart of the Amazonian forests. Time signals have repeatedly been received from Mr. Atkinson at Porto Velho, the starting point of the Madeira-Mamore R.R. Between Porto Velho and the stations on the Rios Rapiiran and Abuna there is no break in the Amazonian forests, but the signals were perfectly receivable in small clearings. Other signals were heard from Lima to Iquitos. The application of wireless telegraphy to expeditions for exploratory surveys opens up visions of new possibilities in which chronometers are relegated to a place of secondary importance. (Condensed from *Geogr. Journ.*, Vol. 43, 1914, No. 2, pp. 206-207.)

#### AFRICA

**Completion of the Tanganyika Railroad.** It was officially announced from Berlin on Feb. 2 that the railroad across German East Africa from Dar-es-Salam to Lake Tanganyika was completed Feb. 1 when the rails were laid down at the western terminus, Kigoma, a few miles north of Ujiji. The railroad is 777 miles long and is likely to have important influence not only upon the development of the German colony but also upon the economic future of the Belgian Congo and of Central Africa generally. Express trains will now be able to reach the coast from the lake in two days as compared with the 42 days' journey of the caravans. An important proportion of the Central African trade is bound to gravitate to Dar-es-Salam.

**Union of Northern and Southern Nigeria.** On January 1 the former colonies of Northern and Southern Nigeria were united under one administration with Sir Frederick Lugard as the first Governor-General. The estimated population of the whole territory is about 17,000,000.

#### ASIA

**Volcanic Eruption in Japan.** A terrific eruption of the volcano of Sakura Shima occurred on January 12. This volcano stands on an island in the Gulf of Kagoshima, an indentation on the south coast of Kiushiu, the southernmost of the large islands of Japan. The eruption was preceded for two or three days by sixty or seventy earthquake shocks. Columns of smoke and flame burst from many parts of the mountainside enveloping the whole island. Lava streams pouring down the slope overwhelmed many villages, and great blocks of stone were shot out of the crater to an estimated height of over 2,700 feet, some falling twenty miles away. The heat of the eruption was intense at the city of Kagoshima, about ten miles west of the volcano on the mainland. The city was set on fire and all the inhabitants fled northward. Many lives were lost, especially in the villages on the little island where the volcano stands; and many hundreds of houses were destroyed by the earthquake shocks which were felt all over Kiushiu. There was a heavy fall of ashes in Nagasaki, about 100 miles to the northwest, and ashes also fell as far away as Osaka and Ogasawara. The number of deaths, at first exaggerated, is not believed to have been over 600 persons.

**Cold Weather Storms of Northern India.** The cold-weather storms of northern India occur between December and April, and are of considerable agricultural importance. It is, therefore, extremely desirable that their origin should be ascertained. The view that these disturbances are generated

over the arid districts of Persia and Beluchistan presents several difficulties. Charts recently prepared by Mr. J. I. Craig, of the Meteorological Service of Egypt, for the years 1906-1912, show that about seven-tenths of the disturbances which affect northwestern India in those months are continuations of depressions from southern Europe, but the paths of the depressions vary considerably from year to year. If these storms pass over Syria or Asia Minor, it is to be expected that severe winters with much precipitation in these areas will tend also to be severe winters in northwestern India. The seasonal rainfall in northwestern India was compared with that of places to the west. The evidence shows that the winter seasons in the west of Asia Minor, in Syria, and in Malta, have a closer resemblance to those of northwestern India than do the winter seasons of Persia and Mesopotamia. (*Memoirs Indian Met. Dept.*, Vol. XXI, Part 7.)  
R. DEC. WARD.

#### AUSTRALASIA AND OCEANIA

**Australian Wheat Farming.** The Commonwealth Meteorologist announced in February that Australia's prosperity for the last ten years had been due not to exceptionally good rainfall but to better understanding of the climatic problem, to better systems of farming and to the vast cereal areas that could now be utilized by artificial fertilization. He estimates that 500,000 square miles have been rendered suitable for wheat growing by the new methods.

**Mineral Resources of Papua.** The *Bulletin of the Territory of Papua* (1913) has reports showing that natural gas, oil, coal and copper are found in the Territory. A gas and oil belt covers about 200 square miles between the Vailala and Purari Rivers and the coast. It is surmised that this district is the prolongation of the oil-fields of the Malayan archipelago. Lignite has been found west of the Purari River between the coast and the valleys of the Samia and Piau Rivers. Copper is reported from the Astrolabe Range in the valley of the Laloki River about ten miles northeast of Port Moresby. Development work has been marked by production and exportation of ore in small quantities.

#### EUROPE

**Geographical Causes of Italian Emigration.** A significant paper by Dr. Alfred Rühl on the "Geographical Causes of Italian Emigration" appeared in the *Zeitschr. der Gesell. für Erdkunde zu Berlin*, 1912, pp. 655-671. The occasion for Dr. Rühl's writing lies in the campaign for the conquest of Tripoli. Referring to a common impression that the Italian Government has been guilty of national piracy, the author proceeds, upon geographical grounds, to pass a milder judgment. The more because France, by its occupation of Morocco, strengthens its position in the west, does Italy, in its central position and with its large population, follow a certain call to become the dominant power in the Mediterranean region. The march to Tripoli is not properly a symptom of an Italian imperialistic policy, but is due to more weighty considerations. Emigration from Italy has become so truly calamitous as to raise a vital question for the future of the nation. To the solving of the problem a parliamentary commission has devoted much attention and has made an extended report upon the conditions of living in the southern provinces.

In the deecennium 1896-1905 emigration from Italy reached the enormous figure of 4,322,425. Tripoli is for Italy the only available region at once near at hand similar to Italy in physical conditions and offering an economic future. Dr. Rühl declines to make any pronouncement upon the wisdom or final good of the movement, but shows from substantial data that it was not sensational or irrational.

The loss of population is not from the large cities but from the rural regions. This loss is grounded upon a number of serious limitations found in the physical conditions of the Italian peninsula, and it is here that the geographical phases of the problem specially appear. The land is mountainous, the alluvial plains of the Po being the only important exception. Terrace culture is toil-

some and costly, and even in Italy the climate at the higher altitudes is harsh. Everywhere the higher lands show much the greater percentages of emigration. A further restriction of utility is found in the malaria, the scourge of some lowlands whose conditions are otherwise good. Here also the percentage of emigration is high. A further condition is found in the incapacity of the chalk formations of the Abruzzi and other mountain districts to retain sufficient water for culture. The barrenness of some regions of granite and schist narrows the power of other southern highlands to support a population. The instability of some slopes and the frequency of landslips form another handicap.

Difficult also are the making and maintenance of means of transportation. This arises from the youth and ruggedness of the land surfaces, the heavy grades to be surmounted and the great number of costly tunnels and other works that are necessary. The common roads also are in many districts of such a character as almost to prohibit the movement of products. Another result of geological youth is the great number and destructiveness of the earthquakes which the land experiences. Nor are the climatic conditions without serious consequences to agriculture. The rainfall, for example, while ample in amount, surpassing even that of middle Europe, has an unfavorable seasonal distribution, and evaporation is large, so that plant life is ill supplied and expensive irrigation is required. Deforestation adds its quota of disaster, and floods all too frequently devastate the valleys.

All these conditions contribute momentum to the movements of emigration. The author hints at the industrial, economic and social improvements which may relieve the difficulties of the national situation, but it is no part of his purpose to discuss matters of this nature. He does affirm, however, that agriculture must continue to lie at the foundation of Italian industry and prosperity.

A. P. BRIGHAM.

**The Amerika-Institut in Berlin.** This institution is a most useful and welcome medium for the interchange of ideas between Germany and the United States. Founded a little more than three years ago, its work is carried on under the auspices of the Prussian Ministry of Education. It is housed in the Royal Library on Unter den Linden, where it has ample offices and has already gathered a serviceable American library of 11,000 volumes. The Director, Dr. Drechsler, and the Assistant Director, Dr. Bertling, have had ample educational experience in America and give unstinted cooperation both to Germans who are investigating American subjects and to Americans making longer or shorter residence in Berlin. Incidental to its main purpose the Institut assists German authors to obtain copyright in the United States and also cooperates with the Smithsonian Institution of Washington in the exchange of documents between Germany and the United States. The handling of more than 34,000 packages in the year 1912 shows the extent of this exchange.

A. P. BRIGHAM.

**The Association of Students of Geography at the University of Leipzig.** Under the name of "Verein der Geographen an der Universität Leipzig" a scientific association of students of geography has recently been organized at that university which, in addition to weekly meetings and frequent excursions, has begun the publication of scientific papers.<sup>1</sup> Founded by Dr. Lehmann in 1911 after the model of the similar association at the University of Vienna, it has become the center of activity among the younger men interested primarily in the scientific aspect of the subject, although teachers of geography in Saxony are joining the association in increasing numbers. The meetings with their discussions tend to clarify the point of view and broaden the knowledge of the members, while the great number of excursions teach observation in the field. Detailed reports on these excursions, prepared mainly by the younger students, afford their authors opportunity for

<sup>1</sup> *Mitteilungen des Vereins der Geographen an der Universität Leipzig*: I (1911), II (1912), III (1913).

Eine geographische Studienreise durch das westliche Europa, von W. Hanns, A. Rühl, H. Spethmann, H. Waldbaur, mit einer Einleitung von W. M. Davis. Leipzig, 1913.

training in original geographical presentation, while the directions and information they contain make them helpful as guides for those who wish to undertake the same excursions by themselves. A large number of prominent university professors, German, Austrian and American, are patrons of the association. Its library, whose value has been increased through its exchanges, supplements the geographical libraries of the city. The present number of members is 156.

WALTER HANNS.

**A Congress of Hispano-American Geography and History in Spain.** A Congress of Hispano-American Geography and History will be held in Seville on April 11-17 to commemorate the fourth centenary of the discovery of the Pacific Ocean. Documents and maps relating to Spain's former American colonies will be exhibited. A considerable amount of unpublished material will be exhibited for the first time, such as the records of the Archivo de Indias, of the Archivos generales de Simancas, Alcalá 6 Histórico, etc.

#### POLAR

**Sir Ernest Shackleton's Next Expedition.** *The Geographical Journal* (Vol. 43, 1914, No. 2, pp. 173-178) prints Shackleton's plans for his coming Antarctic Expedition. He expects to sail from Buenos Aires early in October this year for Weddell Sea, south of the Atlantic, and will establish a winter camp on Prince Luitpold Land, the part of the Antarctic Continent discovered by Filchner in 1912. The second in command will be Frank Wild, a first-class surveyor who was with Scott in 1901-1904, with Shackleton in 1907-1909, and more recently made an important sledge journey along some hundreds of miles of the coast of Wilkes Land. At winter quarters Shackleton will leave a trained biologist, a geologist and a physicist for scientific work and will also provide a party of three to explore the wholly unknown land to the east of the camp.

His main purpose is to cross the South Polar continent from Weddell Sea, south of the Atlantic to Ross Sea. He intends to strike out for the South Pole, from which point he plans to take a route either to the eastward of Amundsen's track to the Pole or between the routes of Scott and Amundsen on their journeys to that region. His route will thus be entirely over new ground. His party of six men will undertake the trans-Antarctic journey with 120 dogs and two sledges. A ship will be provided to meet him at Ross Sea. He hopes to accomplish good results in the various branches of scientific work.

**Stackhouse's Antarctic Expedition.** Further details as to the organization of Mr. J. Foster Stackhouse's expedition supplement the information given in the *Bulletin* (February, 1914, p. 134). Arrangements are being made to leave London on Aug. 1 in Captain Scott's old ship, the *Discovery*. The officers and crew will number 25. The scientific staff will include Lord Congleton and two other experienced surveyors, all officers and scientists giving their services gratuitously. Lieut. A. E. Harbord, R.N., will command the *Discovery*. The expedition expects to be away for three or four years. It will endeavor to settle the question whether King Edward VII Land is a part of the Antarctic Continent or merely a small island, or group of islands; and also explore the coast of the Antarctic Continent between Graham Land in the east and King Edward VII Land in the west. Here is a large stretch of shore line and land forming a vast and practically unexplored region. (Condensed from *The Times*, Weekly Edition, Feb. 6, 1914, London.)

#### WORLD AND PARTS OF IT

**Weather Map of the Northern Hemisphere.** On January 1, the United States Weather Bureau began the publication at Washington of a weather map of the Northern Hemisphere. Hereafter this map will be printed on the reverse side of the morning weather map of the United States. A similar manuscript map of the Northern Hemisphere has been prepared daily

for several past years in the Weather Bureau, and has proved of great value to the forecasters in predicting general changes of the weather, and especially in extending the periods for which such forecasts can be successfully made. Although the number of reports available for the construction of the map is limited at present, and the times of observation are not all strictly simultaneous, still the essential features of the atmospheric circulation over the Northern Hemisphere are fairly well depicted.

It seemed advisable not to retain the arbitrary units ordinarily employed for measuring pressure and temperature of the atmosphere, but to adopt the more scientific and rational units of the C. G. S. system. Accordingly, the reported pressures are all expressed in dynamic units in which a pressure of 750.06 mm. of mercury corresponds to a force of 1,000,000 dynes. The reported temperatures have all been reduced to the absolute scale (Centigrade) on which the temperature of melting ice is 273°.

**The Cruise of the "Carnegie."** Mr. William J. Peters, Chief of the Carnegie Magnetic Expedition, under Dr. L. A. Bauer, director, sends us the following summary of the cruise around the world:

"The yacht *Carnegie*, belonging to the Carnegie Institution of Washington, finished her cruise around the world when she arrived at New York on December 20. Over 1,400 determinations of the magnetic elements were made at sea, distributed over some 92,000 miles. The ports of call were: Vieques (Porto Rico), Para, Rio de Janeiro, Buenos Aires, Cape Town, Colombo, Mauritius, Batavia, Manila, Suva, Papeete (Tahiti), Coronel, Port Stanley, St. Helena, Bahia and Falmouth. Two of these ports were visited twice, Colombo and St. Helena.

"Comparisons of the ship's absolute instruments and the instruments at magnetic observatories were made at Vieques, Pilar, Mauritius, Batavia and Manila, through the courtesies of the officers in charge. These comparisons afford the means of correlating the results of these observatories. The crossings and recrossings of the *Carnegie's* tracks and those of the *Galilee* and *Gauss* will afford valuable data for determining secular change on the oceans.

"The Director of the Department of Terrestrial Magnetism, under which the vessel is operated, Dr. L. A. Bauer, met the *Carnegie* at Colombo and Batavia, and sailed on the passage from Colombo to Mauritius and return. The *Carnegie* had remarkably good weather throughout the cruise until returning home, when she was caught in some of the stormy weather that generally prevails on the Atlantic seaboard in the winter months."

#### MATHEMATICAL GEOGRAPHY AND CARTOGRAPHY

**Present Status of Cartography.** In their recently published "History of Geography" (Putnam's, 1913: in series "A History of the Sciences"), the authors, J. Scott Keltie and O. J. R. Howarth, have the following to say on the present status of cartography, in which the single sentence (italicized below) so aptly characterizing the development of this branch of geography in our country will be read with interest (Chapter XIV, pp. 171-173):

"The work of the cartographer, as exemplified in atlases and small-scale maps of general utility, has by no means in all cases followed the high standard of the surveyor. Commercial considerations are not to be overlooked; cheap and rapid methods of reproduction bring their temptations as well as their advantages to bear upon cartography. Their advantages are manifest; the map, whether as an adjunct to travel or as a graphic illustration of a great variety of subjects, has become a commodity of almost daily use. *But in some countries, such as the United States, the standard of cartography generally is as low as that of the maps of the survey is high.* The reduction and selection of details from a large-scale survey for use on a small general map, the methods of representing such details, the permissible limit of generalizing them, the choice of colors—these and other aspects of cartography really demand a scientific standard as exalted in its way as that of the surveyor. That standard has been most firmly upheld in Germany, in such geographical estab-

lishments as that founded by Justus Perthes at Gotha in 1785, which publishes the famous general atlas originally formed by A. Stieler in 1817-32, the physical atlas of H. Berghaus (1838-42), and many other such works. Other names of individual workers in the same field come readily to the mind—H. Kiepert, A. Petermann, K. von Spruner, Behm, Supan, Langhans, Andree, Debes, A. Ravenstein. The British and French lists are shorter, though the names of John Bartholomew, W. and A. K. Johnston, Edward Stanford and George Philip, Vivien de Saint Martin, F. Schrader and Vidal de la Blache must be remembered."

**The International Map of the World in 1:1,000,000.** Some twelve sheets of this map have been produced in the four years since the First International Map Conference met in London. The work thus far done has demonstrated the desirability of making certain changes in the plan of production agreed to in London. The French Government therefore issued invitations to the other governments interested in the project to attend a second International Conference at Paris, which opened on December 10. Among the delegates present at Paris were Messrs. Penck, Partsch, Brückner, Loczy, Vidal de la Blache, Lallemant, General Schokalsky and Colonel Close. General Bourgeois was in the presidential chair.

It was decided to retain the arrangement of sheets, the projection, scales and unit of heights as agreed upon in London. The subjects of the Paris conference were therefore confined to conventional signs, representation of relief and the principles of the partition of the work.

It soon became evident that no binding decision was possible as to the classification of towns. For example, a town of 20,000 people has very different importance in Europe and in Africa. It was therefore left to the country producing the sheet to classify its towns for itself with the proviso only that the legends on the sheet margin shall explain the system adopted.

The double red line for roads was abolished. The solid line adopted will be more legible on the layer tints. Railroads, telegraphs, navigable rivers and canals were all dealt with and their signs revised in the light of experience. The conventional signs sheet, when issued, will give a better idea of these signs than any verbal description. The conference adopted "*Carte internationale du monde au millionième*" as the official name of the map.

The color scheme for layers was revised and new rules for contours adopted. Certain contours were made obligatory: 200, 500, 1,000, 1,500 meters, and so on; the 100 meter contour is defined as extremely desirable and the insertion or omission of the remainder is left to discretion, subject always to the provision that in principle the interval is still 100 meters. A similar convention governs the contours on the sea bottom.

The color scale decided upon is not very different from the old one up to 1,000 meters, but above that elevation it runs into shades of pure carmine in place of the brown turning to magenta. Layer colors will cease at the line of permanent snow and on the glaciers. The latter will be distinguished from snow-clad spurs by blue glacier lines and by a special bluish shade where necessary. Where the relief of the permanent snows is not sufficiently shown by contours, shade may be added to them at discretion. In fact, each map producing establishment has liberty to do the best it can, which is the only way towards a real solution of the problem. The color scheme for the sea was taken from the oceanographical atlas of the Prince of Monaco.

The preparation of sheets covering the territory of several powers equally capable of undertaking the work must necessarily lead to an exchange of views. A sheet extending from the territory of one such power to that of another with inferior cartographical resources falls naturally to the former. But in some parts of the world, particularly in Asia, there are whole sheets not provided for by this rule which may yet come within the scope of one or perhaps more than one power. In such cases the conference declines to lay down any rule.

The conference was much pleased when the delegate of the Chinese Republic announced that he was authorized by his Government to say that the General Staff at Peking has established in all the provinces of China cartographical

plants charged with the production of the map, and these operations are making steady progress.

Undefined boundaries in South America were settled for map-making purposes in a friendly conference between the representatives concerned, and the partition of Africa was agreed upon in principle.

The British delegation was authorized by their Government to propose that a permanent central office should be established in England with headquarters at the Ordnance Survey, and an auxiliary office in London. The office will have no executive authority and its function will be the publication of an annual report, the exchange of information, and the provision of useful data to all interested. The conference, with appreciative acknowledgments, accepted the proposal. (Condensed from the *Geogr. Journ.*, Vol. 43, 1914, No. 2, pp. 178-182.)

#### GENERAL

**Climate and the Protein Content of Wheat.** Some interesting relations between climate and the protein content of wheat are given by Mr. G. W. Shaw in "The University of California Publications in Agricultural Sciences" (Vol. 1, No. 5). These investigations grew out of the fact that the millers of California found it necessary to import many hundred tons of wheat to maintain the quality of flour owing to the low gluten content of the local wheat. The crop tests showed marked variations in gluten in proportion to changes in precipitation, temperature and sunshine of the growing seasons; also that the higher gluten content came with a somewhat lower rainfall during the growing season. In order to test the influence of sunshine the plats were shaded with lath screens so as to cut off varying amounts of sunshine while portions were allowed to have maximum sunshine. The results showed that the optimum sunshine is slightly less than the normal amount for the valleys of the state. Portions of plats were cooled by shading during the morning hours and were further cooled by ice. The general effect of reducing the temperature was to increase the gluten content. F. V. EMERSON.

#### OBITUARY

**SIR DAVID GILL.** Sir David Gill, the distinguished astronomer, died at his residence in London on January 23 in his 71st year. His scientific fame rests chiefly on his skillful pioneer work in determining the distances of the heavenly bodies. The first successful attempt to measure the distance of a fixed star had been made a few years before he was born, but further progress was very slow until Gill threw his energies into the work. Our knowledge in this direction is still in its infancy and, in his Presidential address to the British Association in 1907, Gill did not venture to say more than that "accurate and minute measurement has given us some certain knowledge as to the distance of the stars within a certain limited portion of space"; that he could say even so much was largely due to his own work and to that which it stimulated in others.

**EDOUARD JANSSENS.** The Society learns with regret of the death of M. Edouard Janssens, President of the Royal Geographical Society of Antwerp, on Feb. 25, 1914, at the age of 50 years.

# GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

## BOOK REVIEWS AND NOTICES

(The size of books is given in inches to the nearest half inch)

### NORTH AMERICA

**The Indian Place Names on Long Island and Islands Adjacent with their probable Significations.** By William W. Tooker. Edited, with an Introduction by A. G. Chamberlain. Published for the John Jermain Memorial Library, Sag Harbor, N. Y. xxviii and 314 pp. G. P. Putnam's Sons, New York, 1911. 9 x 6.

The author and the editor of this book deprecate the loss to our language of so many Indian names. Most people in localities where the natural features, as rivers, bays and hills, have retained names of Indian origin will readily agree that there is something distinctive and desirable in retaining these reminders of the early inhabitants of the land. It is suggested that the names recorded in the book be adopted to designate estates, camps, hotels, cottages and even vessels of all kinds, and to this end in Appendix I the author has arranged a suitable list of names for this purpose. The bulk of the book is given over to an alphabetically arranged list of names, mostly of Algonquin origin. In each case as extensive a statement as could be made of the origin, use and variations is included, so that the book forms an excellent reference book for the philologist and to some degree for the historian and the anthropologist.

ROBERT M. BROWN.

**Early Days on the Yukon.** The Story of Its Gold Finds. By William Ogilvie. xii and 306 pp. Ills. Thorburn & Abbott, Ottawa, 1913. 7½ x 5½.

Mr. Ogilvie died late in 1912, while still in the prime of life. Some years before the Yukon Territory was organized he explored the Porcupine tributary of the Yukon, this work first attracting attention to him. His intimate knowledge of the peoples, geography and resources of the sub-Arctic and Arctic regions embraced in the Yukon Territory, especially adapted him for writing this history. His book is one that no other man could have written. It deals most readably with many phases such as boundary matters, trading posts, gold discoveries and mining, discovery of the Klondike, experiences on the Yukon, methods of mining, administration of law in the early camps, social customs, etc.; and Dr. Alfred Thompson in the Appendix has brought the work down to date.

**The Old Colonial System, 1660-1754.** By George Louis Beer. Parts 1 and 2: The Establishment of the System, 1660-1688. Vol. 1: xvi and 381 pp. Vol. 2: vii and 382 pp. Index. The Macmillan Co., New York, 1912. \$4 for 2 vols.

The value of the historical work of which these two volumes form the first part lies in the story of English administration. This work will fill a gap between earlier works by the same scholar. He has already dealt at length with the origin of British dominions over seas as calling for a system of metropolitan administration, a period of experiment and intrigue which endured in Whitehall and Westminster from 1578 to 1660. In like manner he has presented the results of his study of the period in which the colonial policy of the mother country broke down through mismanagement, a period fairly beginning in 1754 and ending in the insurrection of the American colonies. The present volumes are designed to cover the intervening period, the ninety years when the colonial system had attained a working plan and when it was as well administered as it was possible for such a system to be

administered at long range and with far too little acquaintance with local conditions. Of the two volumes, covering a period of not quite a generation, the former is devoted to the metropolitan aspect of the question, the latter carries the metropolitan determination into the provincial field where it becomes essentially practical. The greater value of this series of studies is that the knowledge presented is essential to our better understanding of the American provinces at the time of our Revolution. Every school child knows glibly that if it had not been for the Stamp Tax and the Boston Tea Party there would have been no Lexington and no Yorktown. It is the object of these volumes to bring to our knowledge the things which galled our forefathers and brought them to the breaking point. Herein we shall see what economic and pocket grief was strong enough to create a band of patriots.

WILLIAM CHURCHILL.

**Through Our Unknown Southwest.** By Agnes C. Laut. 271 pp. Ills. McBride, Nast & Co., New York, 1913. \$2.20. 8½ x 6.

The reviewer has traveled parts of our arid West in company with a great observer, keen to distinguish fact from fancy, and later had a line from his friend, dated west of the 100th meridian "The sky is still clear here!" Miss Laut calls it: "The morning air is pure wine. The hills are veiled in a lilac light—tones, half-tones, shades and subtle suggestions of subdued glory." Her language is exuberant, but it does rouse some sense of the western splendor, and exuberant language is called for. Yet it is not merely turgid language. She has a deep enthusiasm and real restraint. Her reader will long to see the Southwest away from the railroad and she opens charming vistas of inexpensive camping and ranching trips to Forest and Park.

Facts, it is true, she cares little for. Her goal is effects. She refers her antiquities lightly to dates 8,000 and 20,000 years B.C., calling one guess as good as another. Surely her ideas of the age and importance of the primitive civilization are utterly exaggerated. The pictures are admirable.

MARK JEFFERSON.

**Our Southern Highlanders** By Horace Kephart. 395 pp. Ills. Outing Publishing Co., New York, 1913. \$2.50. 8½ x 6.

It was far from the purpose of the author to go very deeply into the demographic problems which cluster about this secluded society. His aim has been to interest by means of his intimate acquaintance with land and people. Yet the movement and character of these people are set forth somewhat more clearly than we recall in any former work upon the theme. The best characterization of the mountain community is that it has remained a frontier despite the advance of settled society beyond it, a frontier facing both ways and scarcely reconciled with a society of which it was the forerunner and by which it was unconsciously overtaken and outstripped.

**The Geography and Industries of Wisconsin.** By R. H. Whitbeck. 94 pp. *Bull. Wisconsin Geol. and Nat. Hist. Surv.*, No. 26. Madison, 1913.

This interesting bulletin is the third in the "Educational Series" of reports prepared by the Wisconsin Geological and Natural History Survey, and is intended primarily for use in the state schools. The industrial geography of the state is discussed under appropriate headings, and the method of treatment is such that the reader's attention is frequently directed to the geographical causes of the facts set forth. As a result the report is by no means a dry collection of statistics, but possesses more real interest for the average reader than the usual run of publications dealing with state industries.

The physical causes underlying the industrial growth of Wisconsin are briefly indicated in an introductory chapter, after which the mineral industries, forestry, agriculture, manufacturing and transportation receive more extended treatment. Numerous pictures, diagrams, and maps are effectively used, while tables of statistics are properly reduced to a minimum. A commendable feature is the concise summary placed at the end of each chapter. Occasionally the details of maps are illegible because of the quality of paper on which the text is printed. On the whole, the report is a creditable addition to the geographical literature concerning Wisconsin, and should prove of much value to the schools of the state.

D. W. JOHNSON.

**The Geography of California.** By Harold W. Fairbanks. 190 pp. Map. Whitaker & Ray-Wiggin Co., San Francisco, 1912. 60 cents.  $7\frac{1}{2} \times 5\frac{1}{2}$ .

The book discusses in Part I the various physical features of California, the natural resources, and the development of occupations. The lack of maps to show climatic conditions and distribution of life forms makes one wonder if the author has improved much upon the "inadequate manner" of other presentations of the geography of the state. Part II deals with the seven different natural regions of California. A reproduction of a photograph of a relief map shows the location of the provinces, but the more detailed discussion lacks illustration either by maps or photographs. The chapter on page 67 headed "Geographical Story of the Sierra Nevada Mountains" has no geography in it, and the slight development of important topics points to lack of care in preparing the material for the press. ROBERT M. BROWN.

#### SOUTH AMERICA

**Studi di Geomorfologia Argentina.** Di G. Rovereto. 1: La Sierra di Cordova. 2: Il Rio della Plata. 3: La Valle del Rio Negro. pp. 102-142. Maps, ill. Reprints, *Bull. Soc. Geol. Ital.*, Vol. 30, 1911, pp. 1-19, pp. 313-350, Vol. 31, 1912, pp. 181-237, Vol. 32, 1913, pp. 102-142. Rome, 1913.  $10 \times 6\frac{1}{2}$ .

These contributions to South American morphology are the outcome of investigations carried on to determine suitable schemes of irrigation. Their contents shed considerable light on the hydrography of the regions examined. The relation of the Sierra de Cordova and the San Luis massif is determined with the hydrographic factor in view. The author points to the existence of separate water systems, the result of the shrinking of a general hydrographic basin into independent units. A cycle of aridity is assumed to cause this condition.

Economic conclusions of practical importance follow these studies. The investigation of the Rio Negro valley, where extensive tracts of land can be reclaimed, is a good instance in point. It is to be hoped that the Dirección General de Irrigación will publish the material gathered by its engineers, part of which has informed the author in these pamphlets. LEON DOMINIAN.

#### ASIA

**Natur- und Kulturbilder aus den Kaukasusländern und Hocharmenien.** Von Teilnehmern der Schweizerischen Naturwissenschaftlichen Studienreise, Sommer 1912, unter Leitung von Prof. Dr. M. Rikli. viii and 317 pp. Map, ills., index. Orell Füssli, Zürich, 1914.  $9 \times 6\frac{1}{2}$ .

The interest of these summer explorations of the Swiss naturalists grows with each succeeding year. In this volume we find the excursion of 1912, spent in the mountains which part Armenia from the Black Sea. Six of the monographs deal with the geographical reconnaissance of the Caucasus and three with the Armenian mountain region and the scaling of Mount Ararat, while three more discuss the geognosy of the steppes. The work is supplemented by two excellent papers on the plant and animal life of the regions surveyed. Long held in superstitious awe as unscalable, Ararat proves to be a very easy mountain to negotiate and to such alpinists as the Swiss naturalists the climb offered no difficulty.

#### EUROPE

**The Seine from Havre to Paris.** By Sir Edward Thorpe. xxi and 493 pp. Maps, ills., index. The Macmillan Co., New York, 1913. 12s. 6d.  $9 \times 6$ .

A delightful account of a leisurely journey up the Seine in a small boat. Apart from the first chapter which deals with the hydrography of the Seine and explains the history and stage of river regulation, the book is devoted

largely to the brief narrative of the day's travel and to more extended accounts of the historical significances of the many riparian towns and sites. The story is made intelligible and attractive by many drawings of specific points of interest along the way, and while many of them are of chapels, streets of doorways, delightful to the artist, there are many which give the Seine a setting and show the character of the country through which it flows. Best of all, the journey can be traced by a map of unusual merit (unusual for a book of travel) and the pleasure in reading the book comes in part from the enlightening influence of a carefully arranged and well executed map.

The book will be of great value to those who contemplate a journey along the Seine and will be an aid to anyone who wishes to know French history and France in detail.

ROBERT M. BROWN.

**The Spell of Switzerland.** By Nathan Haskell Dole. Illustrated from photographs and original paintings by Waldemar Ritter. x and 489 pp. Map, index. L. C. Page & Co., Boston, 1913. \$2.50. 8 x 6.

His charming style may perhaps enable Mr. Dole to extend the fascination that he felt amid the scenes and memories of Switzerland over the readers of his book. Yet the author was apparently more affected by the native geniuses of Switzerland like Rousseau and Calvin, whom the mountains inspired, and by visitors, like Coleridge and Shelley, who were roused to supreme effort by the spectacle, than by the thing itself. The story, written in easy, conversational style, chiefly centers around Lausanne and Lake Geneva. The region between Mont Blanc and the Matterhorn receives considerable attention and a brief visit to Zurich and Lucerne completes the itinerary. The pictures are numerous and of unusual merit.

ROBERT M. BROWN.

**Athens and Its Monuments.** By Charles Heald Weller. xxiv and 412 pp. Ills., index. The Macmillan Co., New York, 1913. \$4. 9 x 6.

To strike the pick and shovel through the waste of centuries and to reproduce Pausanias must be the end of any such work as this. The deeper the student plies his pick, the more of Pausanias he uncovers to our present knowledge, the better he accomplishes his task. The result is a Baedeker of distant ages. This work is all very new. Through all the centuries the Acropolis with its building complex has been well known, but below the hills the situation of Athens was wholly a matter of conjecture long after Rome had been mapped by generations of patient archaeologists. But in the late years, when Athens has been the capital of a Greece once more free, great attention has been paid to the study of its past, a theme particularly dear to the heart of its late king who fostered the national museum and was a stimulating patron of the schools of archaeology which have been established in the capital. One who was familiar with Athens only thirty years ago when its soil was scarcely touched below the hills will read with great surprise this handbook of the past in the present. The incomprehensible gaps in Pausanias, which it was then impossible to fill, have very largely been closed, the ancient city is made plain and now we know where and how the Attic citizens lived their daily life, which was by no means all a matter of temples standing on the heights. The value of this book, heightened by lavish illustration, will be as great in the library of the student as in the clear Athenian air.

WILLIAM CHURCHILL.

**A History of Inland Transport and Communication in England.**

By Edwin A. Pratt. xii and 532 pp. Index. E. P. Dutton & Co., New York, 1912. \$2. 7½ x 5½.

Nearly two hundred pages of this volume supply an exceedingly interesting introduction to transportation in the railroad era. The author begins with early British and Roman roads whose main purpose is shown to have been the carriage of metals to the coast for commerce with the continent. Following the Roman occupation was a period in which the church was the main influence in maintaining such roads as the people had. More than eleven centuries passed, from 411 A. D., the time of Roman withdrawal, to 1555, the date of the first general act for the repair of the roads.

There are chapters on carriages, coaching, the age of bad roads, the turn-pike system, and scientific road making. The account of bad roads shows vividly that Americans are not quite so far behind the mother country in road improvement, as we are wont to think. The account of scientific road making deals with Telford and Macadam, whose main work was in the early part of the nineteenth century, coincident in time with the first great epoch of road building in the United States.

Interior navigation follows under the topics,—rivers and river transport, river improvement, disadvantages of river navigation, and the canal era. The first of this group of chapters is one of the most interesting in its emphasis on the efficiency of rivers in the early days, in promoting the progress of towns on their banks, when the inter-stream areas were difficult of access. One of the examples noted at some length is the Severn and its branches bordered by many towns and on whose waters in 1756 there were nearly 400 vessels.

About half the volume relates to the history and administration of English roads and here the author is in the field of much of his previous work. From the origin and expansion of railroads he passes to chapters on railroads and the state, rates and charges, the railroads of to-day, and railroads as a national industry. Two chapters are given to yet more modern ways of transport, such as street cars, the motor bus, cycles and electric traction. The "Outlook" discusses among other questions that of aerial transportation. A rather full list of authorities is included in the volume.

A. P. BRIGHAM.

#### WORLD AND PARTS OF IT

**La Grande Boucle.** Notes et Croquis de l'Ancien Continent et des Deux Amériques. Par Maurice Rondet-Saint. vi and 314 pp. Map. Plon-Nourrit et Cie, Paris, 1910. 7½ x 5.

The author writes with nervous vigor and photographic effect. Most of his matter is adapted to give the general reader useful, and in the main, correct information about many of the important places he visited on his extended journey. Occasionally, however, he is inaccurate and, at least in our country, he seems unfairly influenced by his prejudices. Most of us are "Yankees" and his comments on the various phases of this particular species of the human race are flippant and funny. It is to be regretted, if true, that any mention of our Far West always suggests to the author "the romances of Fenimore Cooper." This idea introduces his remarks on Seattle-Tacoma, nearly 3,000 miles west of the region where Cooper and many of the Indians he depicted lived out their days.

#### PHYSICAL GEOGRAPHY

**Das Gesetz der Wüstenbildung.** Von Johannes Walther. 2. neubearbeitete Auflage. xv and 342 pp. Ills., index. Quelle & Meyer, Leipzig, 1912. Mk. 12. 10 x 7.

The appearance of a splendid new edition of this long since exhausted work by the "desert geologist" Walther, is an event of importance to students of geological science. The delay in issuing the new edition has been due to the author's wish to complete further desert studies with a view to clearing up many subjects concerning which uncertainty existed. As a result we now have an essentially new book comprising twice the number of pages and including three times the number of illustrations. The illustrations are high grade half-tones made from excellent photographs. Remarkable as they are as examples of what good modern book-work may be, they are as a whole even more noteworthy as well selected types in illustration of the characteristic desert processes.

The author's clear and graphic style and his excellence of presentation are here shown at their best. Despite the wealth of observed fact and the introduction of a good many exact figures, the interest never flags, and one

reads under a certain fascination as the desert scenes are one after the other unrolled as upon a huge panorama. If we take account of the psychology of our geological theories, it must be realized that they have almost throughout been modeled from the ever-present scenes of the generally habitable humid countries. It has mattered little that a fifth of the continental surface is desert, a much larger area half-desert, and that with much probability these proportions were even larger in the geological past. In so far as the contrasted geological processes characteristic of arid and humid regions have been appreciated at all, they have thus far influenced but little our conceptions of the great erosional and depositional processes in present or past time. More than any other, Professor Walther has focused attention upon these essential contrasts, and in the face of much opposition is forcing a reluctant recognition of the importance of studying the deserts in order correctly to interpret the past. Such a recognition is necessarily slow, since it involves a making over of fundamental doctrines of the science of geology.

It was a study of the enormously thick deposits of barren conglomerates, sandstones and shales with their included gypsum and salt layers, belonging to the transition from Paleozoic to Mesozoic in Europe, which, a quarter of a century ago, drove Walther into the desert for a possible solution of the puzzle. Later journeys have since been undertaken until now his personal experience of desert conditions includes both borders of the Red Sea, Egypt and the Sudan, and the arid lands of Turkestan and North America. It is by correlation of facts drawn from so many widely separated regions that the general principles underlying desert processes have been skillfully deduced.

The book is divided into 31 sections organized under the four heads: (1), the essential conditions of deserts; (2), desert weathering and transportation; (3), desert deposition; and (4), the earlier deserts. The four types of climate recognized are: nival or snow climate, the humid climate, the arid climate, and the pluvial climate. Each is generally characterized by a special type of precipitation and a characteristic color of soil. Where a nival climate prevails precipitation occurs mainly as snow, and the soil is gray to black according as organic acids have leached out the materials. With humid climate precipitation takes place mainly as rain in summer and as snow in winter, the soils being characteristically rust-brown in color from oxidation and hydration of iron. In a land of arid climate there is little precipitation of any kind and the soils, altered but little chemically, retain their original and varied colors, though the finer wind-borne portions, when carried to the moister zones at the desert margin, become rust-brown. Lastly, the pluvial climate with heavy rain precipitation and high air temperatures is characterized by deep red soils covered by a heavy mat of vegetation.

One of the most striking contrasts between arid and humid regions is brought out in maps of the divides or watersheds. Of humid countries it is true that the divides radiate from the highest point and continue to divide and subdivide until they reach the sea, but nowhere touching or crossing each other. In a region without outflow, on the other hand, they cross and recross to form the network of larger and smaller meshes.

The desert weathering process which in the original edition was described as *insolation*—the rending of rocks when highly heated on the surface under the desert sun and suddenly chilled by a dash of rain—is much more fully treated in the new edition and supported by admirable illustrations. We think it unfortunate that a term already in general use to describe the distribution of the sun's rays over the globe should have been given a new meaning, and we have elsewhere suggested the term *diffusion* as more appropriate.

The general lack of rain, which in humid countries carries the air with it into the soil so as to ventilate and oxidize the soil particles, accounts for the far more varied (original) hues of rock débris within a desert. Chemical decomposition of rocks there involves wholly different reactions from those of humid regions. Proof of this is supplied by the hard rock rinds and altered cores of the loose desert rocks which contrast so strongly with the reversed relationships in those found within humid regions. In addition to the brown protective rock rind generally known as "desert varnish" and

believed to be due to a drawing out of salts from the interior and fusion reactions at the surface of the rock, Walther has distinguished two additional types of coating. These are described as "dust rinds," where fine rock dust carried by a strong wind is driven into all surface cracks and pores; and "cataract rinds," formed beneath the water in stream rapids and composed, as Lucas has shown for those seen at Assuan, mainly of manganese and iron oxides together with lime silica and magnesia.

As in the earlier edition, the pan-like form of deserts is probably somewhat too strongly emphasized. The extended high plateau, or hamada, which American and French savants in particular have made known, has not influenced Walther's general definitions as much as it should have done. Likewise the statements concerning a desert's lack of outflow are somewhat too emphatically made in view of the examples of the Nile and Colorado particularly. To the many striking characteristics of deserts which were brought out in the original edition of the work, is now added that of a surface armor due to the removal by the wind of all materials which readily succumb to weathering processes and become finely divided, thus leaving a layer composed of the various hard and insoluble concretions. Such an armor is naturally best developed upon the high hamadas which are preeminently areas of removal rather than of deposition of debris. Yet of the broadly extended weather pans it is likewise true that the peculiar weathering processes and the lack of the shielding mat of vegetation found in humid regions, makes all rock material which can succumb to the disintegrating agencies the special prey of the winds to be by them carried out of the desert. Walther believes that the great pans themselves have originated by this process, and supports his view by such a wealth of well ordered observations as to be quite convincing.

The book is marred by an extended and ever recurring argument to support the author's view that what has been brought forward as evidence from the deserts of changes of climate may all be explained by local cloudbursts. He would appear to be unaware of the existence of the most important recent literature upon the subject. It is really remarkable that in the list of 157 monographs treating of deserts with which the work is concluded, the names of Raphael Pumpelly and Ellsworth Huntington should nowhere appear. The book throughout takes far too little account of other than German workers. It is none the less a great work and as a general treatise upon the subject of desert geology altogether unique. A very large proportion of the illustrations have been drawn from Egypt so that the book may be used to special advantage by the many who visit that country and make the trip up the Nile Valley to the cataracts.

WM. HERBERT HOBBS.

**Studi di Geomorfologia.** Di Gaetano Rovereto. Vol. 1: 1.—Alcuni problemi di geologia e di morfologia della Corsica; 2.—Il M. Cervino; 3.—La Val San Giacomo; 4.—La Valle della Cetina in Dalmazia; 5.—Le Alpi Apuane; 6.—Il M. Cònero; 7.—l'Isola di Capri. 270 pp. Ills. E. Olivieri & Co., Genova, 1908. 10 x 7.

This is a final contribution to the author's investigations on coastal morphology. The sequence in his researches is apparent. He has proceeded systematically inland from the sea-shore by examining valleys first and the mountainous regions at their head afterwards. Each of the regions described must be considered as an applied example of principles previously advanced by him. The hydrography in each case has been investigated with particular care. The results of human occupation are considered somewhat too briefly for a region like the basin of the Mediterranean where the relation of man to land forms might be worked up admirably.

LEON DOMINIAN.

**Sand Dunes and Salt Marshes.** By Charles Wendell Townsend. 311 pp. Ills., index. Dana Estes & Co., Boston, 1913. \$2. 8½ x 6.

For twenty years the author has studied the sand dunes and salt marshes of Ipswich, and all the forms of life associated with these physiographic features. The scientific data collected are presented in this book. Some of

the subjects discussed are sand dunes, their evolution and their relation to life; animal tracks in the sand and how to decipher them and read their story; vegetation, land and sea birds, seals. The general topics described in connection with salt marshes are similar to those considered under sand dunes. The book concludes with a chapter on bird genealogy dealing with the evolution of the physical attributes, habits and general life of the bird. The many fine photographs have a definite relation to the text, which they serve to make yet more clear. The volume would be well worth having for the illustrations alone.

WILBUR GREELEY BURROUGHS.

#### ECONOMIC AND COMMERCIAL GEOGRAPHY

**The Improvement of Rivers.** A Treatise on the Methods Employed for Improving Streams for Open Navigation, and for Navigation by Means of Locks and Dams. By B. F. Thomas and D. A. Watt. 2nd edition, rewritten and enlarged. Part 1: xiv and 333 pp. Part 2: viii and pp. 334-749. Maps, ill., index in each. J. Wiley & Sons, New York, 1913. \$7.50. 2 vols. 12 x 10.

Government reports and the publications of waterway associations have dealt extensively with the problem of river improvement but most of the conclusions of these publications assume an issue against a counter doctrine, and the reader fears lest the evidence has not been openly stated. Scarcely a book available to the English reading public had treated the subject of the improvement of rivers until the first edition of the books by Thomas and Watt appeared; and in the new edition the authors have followed their policy of stating the facts without formulating opinions concerning current theories of waterway regulation.

The book opens with an excellent summary of the characteristics of rivers and this is followed by a general chapter on the principles of regulation which are exemplified in the large streams of Europe and America. In succeeding chapters the various types of work are considered. These formulate a basis of fact for the student of the problem and prepare him for a large view of the question which is attracting much attention to-day. Dredging and snagging, dikes, protection of banks, levees, storage reservoirs, river outlets, locks and dams are all treated in a masterly way. In every case the question is discussed broadly and the evidence from the experimentation on many streams under their varying physical conditions gives a proper approach to the subject of regulation. The first volume has for its special topic the improvement by regulation and the second volume discusses improvement by canalization. The text is illumined by a vast array of drawings, pictures and plates which seem to be indispensable to the volumes, but it is unfortunate that so excellent a work on a topic of great importance to us should have the handicap of a high price and much bulk.

ROBERT M. BROWN.

**Geographie des Welthandels und Weltverkehrs.** Von Dr. Ernst Friedrich. viii and 429 pp. Maps, index. Gustav Fischer, Jena, 1911. Mk. 11. 10 1/2 x 6 1/2.

This is a handbook rather than a text-book. Friedrich has been known for the past fifteen years as one of the leading German authorities on economic and commercial geography. He has had an important part in systematizing the subject for study in the schools. This work is the rich result of the many years he has spent in the coordination, study and teaching of the topic. His arrangement of the material is that now largely employed in German text-books. In Part I he collates the general principles of trade and communications, the natural and human influences that affect them and the plant, animal and mineral materials with which they deal. He devotes Part II to a discussion of the special trade and commerce of each of the continents. A notable feature of the work is the great mass of data on every phase of the topic, and this, by the way, is characteristic of all of Friedrich's writings. The work ranks with the best handbooks in its class and will be helpful to all teachers of this branch of geography.

**Carriage by Sea.** By Jiujiro Ito. In Japanese with an English abstract of 10 pp. Part I: 180 pp. Part II: 267 pp. Map. Waseda Univ., Tokyo, 1911. 9 x 6.

The work is an expansion and in parts an amplification of the doctor's thesis presented by Dr. Ito at the University of Pennsylvania. Carriage by sea is defined to include conveyance both of persons and merchandise and the kinds are classified according to routes, to kinds of vessels, kinds of traffic and to management.

In his discussion of the development and economic and political effects of marine carriage the author recognizes the highly competitive nature of the business if allowed to spring up in response to geographical conditions, and the highly monopolistic nature if restricted by legislation, subsidies and combinations. Contrary to some writers he seems to believe that a nation's colonial expansion is in proportion to her sea carrying capacity.

G. D. HUBBARD.

**Handelsgeographie.** Von Dr. Karl Zehden. 11. vollkommen umgearbeitete Auflage. Bearbeitet von Dr. Robert Sieger. iv and 702 pp. Map. Alfred Hölder, Wien, 1911. 9 x 6.

The first edition of this book was practically the pioneer in the long list of text-books on commercial geography. It was a good product and an inspiration to later writers, some of whom evolved improvements in presenting the subject for educational purposes. Dr. Sieger, of the University of Vienna, has changed the book in many respects to make it conform more closely with present methods of presenting the topic to students. It still contains an enormous amount of data like all other German texts on the subject. In this respect it differs from recent similar texts in English which aim to emphasize principles and not to overload them with a vast array of facts.

#### GENERAL

**Geologen Kalender.** Begründet von K. Keilhack. Herausgegeben unter Mitwirkung der Deutschen Geologischen Gesellschaft. 10. Jahrgang für die Jahre 1913-14. 302 pp. Bearbeitet von W. Quitzow. Max Weg, Leipzig, 1913. Mk. 4. 7 x 5.

The 1911-12 issue of this useful publication was reviewed in the *Bulletin*, Vol. 43, 1911, pp. 786-787. In the present edition a slight increase in format and the use of thinner paper have made possible a volume only half an inch thick, which fits readily into the pocket. The usual valuable features are maintained: a directory of geologists, a list of the geological surveys and geological societies of the world, information about the International Geological Congresses and the International Geological Map of Europe, etc. A section, published for the first time in this edition, is devoted to the Geological Map of the World, accompanied by an index map. There are also various tables of interest to the geologist.

### OTHER BOOKS RECEIVED

*These notes do not preclude more extended reference later*

#### NORTH AMERICA

THE FIRST EXPLORATIONS OF THE TRANS-ALLEGHENY REGION BY THE VIRGINIANS, 1650-1674. By Clarence Walworth Alvord and Lee Bidgood. 275 pp. Maps, ills., index. A. H. Clark Co., Cleveland, 1912. \$4. 9½ x 6½.

A GUIDE TO FLORIDA for Tourists, Sportsmen and Settlers. By Harrison Rhodes and Mary Wolfe Dumont. With a Chapter on the Inland Waterways from New York to Key West. 456 pp. Maps, ills., index. Dodd, Mead & Co., New York, 1912. \$2.25. 6½ x 4½.

THE YELLOWSTONE NATIONAL PARK. Historical and descriptive. By H. M. Chittenden. Seventh edit. x and 355 pp. Maps, ills., index. Stewart & Kidd Co., Cincinnati, 1912. \$1.50. 7½ x 5½.

## CENTRAL AMERICA AND WEST INDIES

THE POCKET GUIDE TO THE WEST INDIES. By Algernon E. Aspinall. New and revised edition. xv and 315 pp. Maps, ills., index. E. P. Dutton & Co., New York, 1911. \$1.50. 7 x 4½.

TEMBLORES, TERREMOTOS, INUNDACIONES Y ERUPCIONES VOLCÁNICAS EN COSTA RICA, 1608-1910. Datos compilados por el Lic. Cleto González Viquez. 200 pp. Ills. Avelino Alsina, San José, 1910. 9½ x 6½.

## SOUTH AMERICA

THE UNITED STATES OF BRAZIL WITH A CHAPTER ON THE REPUBLIC OF URUGUAY. By C. W. Domville-Fife. xxiii and 249 pp. Map, ills. J. Pott & Co., New York, 1913 (?). \$2.50. 9 x 6.

PERU OF THE TWENTIETH CENTURY. By P. F. Martin. xx and 348 pp. Map, ills., index. Edward Arnold, London, 1911. \$4.20. 8½ x 5½.

THE PATH OF THE CONQUISTADORES. Trinidad and Venezuelan Guiana. By L. Bates, Jr. vii and 308 pp. Map, ills., index. Houghton Mifflin Co., Boston, 1912. \$3.50. 9 x 6.

## AFRICA

THE KHALIFATE OF THE WEST. Being a general description of Morocco. By Donald Mackenzie. xiv and 274 pp. Maps, ills., index. Simpkin, Marshall, Hamilton Kent & Co., London, 1911. 10s. 6d. 9 x 6.

LIBERIA: DESCRIPTION, HISTORY, PROBLEMS. By Frederick Starr. xiv and 277 pp. Map. The Author, Chicago, 1913. 7½ x 5.

THE MINERAL INDUSTRY OF RHODESIA. By J. P. Johnson. 90 pp. Index. Longmans, Green & Co., New York, 1911. \$3. 8½ x 6.

## ASIA

GLEANINGS FROM FIFTY YEARS IN CHINA. By the late A. Little. Revised by Mrs. A. Little. New edit. xvi and 330 pp. Ills., index. Sampson Low, Marston & Co., London, 1909 (?). 5s. 8½ x 5½.

THE FACE OF MANCHURIA, KOREA AND RUSSIAN TURKESTAN. By E. G. Kemp. xv and 248 pp. Map, ills., index. Chatto & Windus, London, 1910. 7s. 6d. 9½ x 7.

THE PASSING OF THE MANCHUS. By P. H. Kent. xi and 404 pp. Map, ills., index. E. Arnold, London, 1912. \$4.20. 9 x 6.

## AUSTRALASIA AND OCEANIA

ACROSS AUSTRALIA. By B. Spencer and F. J. Gillen. Vol 1: 254 pp. Vol. 2: pp. 255-515. Maps, ills., index. Macmillan & Co., London, 1912. £1 1s., 2 vols. 8½ x 5½.

THE HISTORY OF THE AUSTRALIAN COLONIES. Part 1: New South Wales. Part 2: The Other Colonies. Compiled by Joseph Finney. xi and 351 pp. Maps. W. A. Gullick, Govt. Printer, Sydney, 1902. 7½ x 5.

TERRE NAPOLÉON. A history of French explorations and projects in Australia. By E. Scott. 2nd edit. xx and 295 pp. Maps, ills., index. Methuen & Co., London, 1911. 10s. 6d. 9 x 6.

SEVENTEEN YEARS AMONG THE SEA DYAKS OF BORNEO. A record of intimate association with the natives of the Bornean jungles. By E. J. Gomes. xx and 343 pp. Map, ills., index. Seeley & Co., London, 1911. 16s. 9 x 6.

HAWAII UNDER KING KALAKAUA. From personal experiences of L. H. Hallock. 72 pp. Ills. Smith & Sale, Portland, Me., 1911. \$1. 7½ x 4.

THE STORY OF HAWAII. By Mary C. Alexander. 272 pp. Map, ills. American Book Co., New York, 1912. 75 cents.  $7\frac{1}{2} \times 5\frac{1}{2}$ .

PAPUA OR BRITISH NEW GUINEA. By J. H. P. Murray. With an introduction by Sir William MacGregor. 388 pp. Map, ills., index. Charles Scribner's Sons, New York, 1912. \$3.75.  $9 \times 6$ .

SCENTED ISLES AND CORAL GARDENS. Torres Straits, German New Guinea and the Dutch East Indies. By C. D. MacKellar. xiii and 351 pp. ills., index. J. Murray, London, 1912. 15s.  $9 \times 6$ .

VOM WIRTSCHAFTSLEBEN DER PRIMITIVEN VÖLKER. Unter besonderer Berücksichtigung der Papua von Neuguinea und der Sakai von Sumatra. Vortrag gehalten am 10. Juli 1911 im Inst. für Seeverkehr und Weltwirtschaft zu Kiel. Von Dr. Max Moszkowski. Probleme der Weltwirtschaft, V. 50 pp. Gustav Fischer, Jena, 1911.  $10\frac{1}{2} \times 7\frac{1}{2}$ .

### EUROPE

DIE DEUTSCHE VORGESCHICHTE EINE Hervorragend Nationale Wissenschaft. Von Gustaf Kossinna. Mannus-Bibliothek, Nr. 9. 100 pp. ills., index. Curt Kabitzsch, Würzburg, 1912. Mk. 5.  $10\frac{1}{2} \times 7\frac{1}{2}$ .

IN THE RHÔNE COUNTRY. By Rose G. Kingsley. x and 307 pp. ills., index. E. P. Dutton & Co., New York, 1913 (?). \$3.  $8 \times 6$ .

THE PASSES OF THE PYRENEES. A practical guide to the mountain roads of the Franco-Spanish frontier. By C. L. Freeston. xiii and 196 pp. Maps, ills., index. Kegan Paul, Trench, Trübner & Co., London, 1912. 10s. 6d.  $8\frac{1}{2} \times 6$ .

THE TRUTH ABOUT SPAIN. By G. H. B. Ward. 2nd edit., revised. xv and 296 pp. Cassell & Co., London, 1913. 7s. 6d.  $8\frac{1}{2} \times 5\frac{1}{2}$ .

LITTLE CITIES OF ITALY. By A. Maurel. Translated by H. Gerard. xvi and 475 pp. ills. G. P. Putnam's Sons, New York, 1913. 9s.  $8 \times 5\frac{1}{2}$ .

PLAIN-TOWNS OF ITALY. The Cities of Old Venetia. By E. R. Williams. xxiii and 603 pp. ills., index. Smith, Elder & Co., London, 1912. 12s. 6d.  $8\frac{1}{2} \times 6$ .

HISTORICAL GEOGRAPHY OF SCOTLAND. By W. R. Kermack. 134 pp. Map, index. W. & A. K. Johnston, Ltd., Edinburgh, 1913. 2s. 6d.  $7\frac{1}{2} \times 5$ .

THE LOST TOWNS OF THE YORKSHIRE COAST and other chapters bearing upon the geography of the district. By T. Sheppard. xviii and 329 pp. Map, ills., index. A. Brown & Sons, London, 1912. 7s. 6d.  $9 \times 6$ .

### ECONOMIC AND COMMERCIAL GEOGRAPHY

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## NEW MAPS

EDITED BY THE ASSISTANT EDITOR

For system of listing maps see p. 74 of this volume

MAPS ISSUED BY UNITED STATES GOVERNMENT BUREAUS

U. S. COAST AND GEODETIC SURVEY\*

**Alaska.** [Two maps:] (1) Tlevak Narrows, S. E. Alaska. Surveyed 1912. 1:20,000. 55°16.5' - 55°13.5' N.; 133°11' - 133°5' W. 1 color. (2) Sukkwan

\* Only new charts are listed, not new editions of old charts.

Narrows, S. E. Alaska. Surveyed 1912. 1:20,000. 55°12.5' - 55°9.5' N.; 132°53' - 132°49.5' W. 1 color. Chart No. 8153. Oct. 1913. Price 30 cents.

**Canal Zone-Panama.** Panama Canal and Approaches. [Mean scale, 1:145,000.] 9°25' - 8°25' N.; 80°0' - 79°25' W. 5 colors. Chart No. 954. Feb. 1914. 30 cts.

[One of the new charts published in view of the prospective opening of the Panama Canal. A similar one, No. 953, showing the Pacific approaches to the canal on a larger scale, was listed in the *March Bull.* (Vol. 46, p. 234). On Chart No. 954, colors are exceptionally used, the water being shown in light blue, the canal in deep blue, Panama territory in buff and the Canal Zone in pink.]

**North Carolina.** Pamlico River. 1:40,000. 35°34' - 35°18' N.; 77°5' - 76°38' W. 1 color. Chart No. 537. Feb. 1914. 50 cts.

[Replaces old Chart No. 1441 on the scale of 1:80,000.]

**Philippine Islands.** [Two maps:] (1) Silangan Pass, East Coast of Luzon. Surveyed in 1907. 1:20,000. 14°2.5' - 13°58.0' N.; 122°8.5' - 122°12.5' E. 1 color. (2) Hondagua Harbor, East Coast of Luzon. Surveyed in 1907. 1:20,000. 13°58.0' - 13°53.5' N.; 122°10.5' - 122°15.0' E. 1 color. Chart No. 4273. Oct. 1913. 20 cts.

## NORTH AMERICA

### UNITED STATES

**Colorado.** (a) Topographic Map of Colorado. Prepared by R. D. George from maps and data of the U. S. Geological Survey; the . . . Hayden, . . . King . . . and . . . Wheeler [Surveys]; the State Geological Survey of Colorado; Land Plats in the office of the Surveyor General (Denver); Maps of the U. S. Reclamation Service, and the U. S. Forest Service; Maps furnished by county officials, railway companies, industrial corporations, State Highway Commission, etc. 1913. 1:500,000. 9 colors. With four insets, 1:126,720, in 1 color: (1) Canon City District, (2) Vicinity of Leadville, (3) Part of City and County of Denver, (4) Cripple Creek District.

(b) Geologic Map of Colorado. 1913. 1:500,000. 66 colors.

Published by the Colorado State Geological Survey, Boulder, Colo.

[Map (a) is an excellent general map of Colorado showing relief in contours (interval 500 feet), supplemented by six hypsometric tints in brown (change of color at 5,000, 7,000, 9,000, 11,000 and 13,000 ft.). Drainage is in blue, railroads and towns (copious nomenclature) in black, state highways in green, national park and forest reservation boundaries and military reservations in red. The omission of all topographical detail within the administrative limits of Denver is to be regretted. The base used is one of the state maps on the scale of 1:500,000 prepared by the U. S. Geological Survey as a basis for the compilation of the relevant sheets of the International Map of the World, 1:1,000,000. This series of maps is an excellent incentive to the preparation of general state maps by the individual states, and Colorado is to be congratulated upon having made so admirable a start.

Map (b) will doubtlessly become the standard geological map of the state and a worthy successor to Hayden's similar map on the smaller scale of 1:760,320 (Sheet IV of his *Atlas of Colorado*, 1877) which was based on the large-scale sheets in 1:253,430 in the same atlas. Thirty-seven sedimentary formations and 12 types of igneous rocks are distinguished. The regions of which geological folios have been published are shown in detail, while the surrounding regions are shown undifferentiated. This, of course, leads to an unnatural and disconnected appearance which, it might be argued, were better avoided on a general map.]

## AFRICA

**British East Africa.** (a) Sketch Map to illustrate a paper by Capt. C. N. French (Hants Regt.). From a Compass Traverse by G. F. Archer, 1911-12. 1:3,000,000.  $4\frac{1}{2}^{\circ}$ - $2^{\circ}$  N.;  $40^{\circ}$ - $43^{\circ}$  E. With inset, 1:40,000,000, showing location of main map.

(b) Explorations and Surveys in the Northern Frontier District by G. F. Archer. 1909-12. 1:800,000.  $3^{\circ}45'$ - $0^{\circ}20'$  N.;  $36^{\circ}28'$ - $39^{\circ}13'$  E. 2 colors. With two insets: (1) Chart of Triangulation. 1:2,000,000. (2) [Sketch map of British East Africa and adjoining region showing location of main map]. 1:12,000,000. 1 color.

Accompany: map (a), on p. 431, "A Journey from the River Juba by Dolo, Moyale, and Mount Marsabit to the Uaso Nyiro (British East Africa: II)" by C. N. French, and map (b), "Recent Exploration and Survey in the North of British East Africa (British East Africa: I)" by G. F. Archer, *Geogr. Journ.*, Vol. 42, 1913, No. 5, pp. 430-435 and 421-430, respectively.

[Valuable maps covering together the ill-known northern part of British East Africa from Lake Rudolf to the Juba River. Map (b), which comprises the western portion of this region, is based on a system of triangulation; relief is shown in brown contours, drainage in blue. A list of positions, expressed in geographic coordinates, also accompanies the map.]

**Egypt.** The Farafra Depression and Bu Mungar Hattia, by W. J. Harding King, 1912. 1:1,250,000.  $27^{\circ}25'$ - $25^{\circ}10'$  N.;  $27^{\circ}17'$ - $31^{\circ}0'$  E. 1 color. With inset, 1:20,000,000, showing location of main map. Accompanies "The Farafra Depression and Bu Mungar Hattia" by W. J. Harding-King, *Geogr. Journ.*, Vol. 42, 1913, No. 5, pp. 445-461.

[Valuable map, based on a route survey by the author, comprising the depressions of the Kharga, Dakhla and Farafra oases, the last of which had not yet been completely surveyed by the Survey Department of Egypt. Bu Mungar is a *hattia* (an uncultivated and not permanently inhabited oasis) lying to the southwest of Farafra whose existence has only been known within the last few years and whose astronomical position was first determined on this journey. Relief (scarps and dunes) are shown in brown; previous travelers' routes (Rohlfs, 1874; Lyons, 1894; Beadnell, 1897; Hoskins, 1906-07) in black. Cf. also the same author's maps of (1) Kharga, Dakhla and the region to the southwest, and of (2) the Libyan Desert in general, listed in the *Bull.* under "Sahara," Vol. 44, 1912, p. 477, and Vol. 45, 1913, p. 957, respectively.]

**French West Africa.** Colonie du Haut-Sénégal-et-Niger: Carte du Bambouk et des régions avoisinantes. Dressée par A. Meunier. 1:200,000. [In six sheets, 1 color, viz.:] (1) Feuille 1.  $15^{\circ}$ - $14^{\circ}$  N.;  $12^{\circ}40'$ - $11^{\circ}40'$  W. (2) Feuille 2 [with title].  $15^{\circ}$ - $14^{\circ}$  N.;  $11^{\circ}40'$ - $10^{\circ}40'$  W. (3) Feuille 3.  $14^{\circ}$ - $13^{\circ}$  N.;  $12^{\circ}40'$ - $11^{\circ}40'$  W. (4) Feuille 4.  $14^{\circ}$ - $13^{\circ}$  N.;  $11^{\circ}40'$ - $10^{\circ}40'$  W. (5) Feuille 5.  $13^{\circ}$ - $12^{\circ}$  N.;  $12^{\circ}40'$ - $11^{\circ}40'$  W. (6) Feuille 6.  $13^{\circ}$ - $12^{\circ}$  N.;  $11^{\circ}40'$ - $10^{\circ}40'$  W. [Ministère des Colonies, Paris, no date (later than 1909).]

[Important official map on relatively large scale embodying all existing information. The route and other surveys on which it is based are listed on the title sheet (Feuille 2). The region shown comprises the western edge of the West Sudan plateau lying between the upper Senegal and Gambia Rivers, the Bambouk region being that portion of it which is included between the upper Senegal and its source stream, the Bafing, and the Faleme River. Drainage is in blue and relief (mainly *Inselberge* and escarpments) in generalized contours in black; railroads, constructed and projected, are also shown.]

## ASIA

**Turkey in Asia.** Der Zug des Cyrus durch Kappadozien und Zilizien verglichen mit der Trasse der Bagdadbahn. Entworfen von Walter Siede. 1:750,000.  $38^{\circ}20'$ - $35^{\circ}40'$  N.;  $32^{\circ}10'$ - $37^{\circ}20'$  E. 3 colors. Accompanies, as Taf. 39, "Der Marsch des Cyrus durch Kappadozien und Zilizien" by W. Siede, *Petermanns Mitt.*, Vol. 59, II, 1913, Oct., pp. 233-236.

## AUSTRALASIA AND OCEANIA

**German New Guinea.** Die Admiralitätsinseln (Deutsch-Neuguinea). Auf Grundlage der deutschen Seekarte ergänzt von Dr. Ludwig Cohn. 1:500,000. 1°50' - 2°35' S.; 146°28' - 147°52' E. 2 colors. With inset: Der Unterlauf des Liai. 1:50,000. 2°2' and 147°15' E. 2 colors. Accompanies, as Taf. 52, "Beobachtungen von den Admiralitätsinseln" by L. Cohn, *Petermanns Mitt.*, Vol. 59, II, 1913, Dec., pp. 315-320.

**Kaiser Wilhelms Land.** Vorläufige Karte des Gebietes des Kaiserin-Augusta-Flusses (Sepik). (Kaiser Wilhelmsland). Nach den neuesten Forschungen, besonders nach den Aufnahmen von Dr. W. Behrmann zusammengestellt von M. Moisel. 1:2,000,000. 3°2' - 5°16' S.; 141°45' - 145°25' E. 1 color. Accompanies, as Taf. 53, "Zur Luftschiffexpedition nach Neuguinea," *Petermanns Mitt.*, Vol. 59, II, 1913, Dec., p. 327.

[Based on the map listed under the same heading in the *Bull.*, Vol. 45, 1913, p. 718. Relief in contours.]

## EUROPE

**Balkan Peninsula.** Die neuen Grenzen des Königreichs Serbien. Nach Angaben des kgl. Serbischen Generalstabes. Die neuen Grenzen des Königreichs Bulgarien gegen Rumänien, Serbien und Griechenland. Nach dem Vertrag von Bukarest vom 20. Juli (10. August), 1913. 1:1,500,000. 45° - 40½° N.; 16½° - 30° E. 10 colors. Accompanies, as Taf. 54, "Die neuen Grenzen des Königreichs Serbien und Bulgarien" by P. L[anghans], *Petermanns Mitt.*, Vol. 59, II, 1913, Dec., p. 34.

[A somewhat elaborate reprinting of Sheets 51 and 52 of Stieler's Hand-Atlas, in view of the fact that the boundaries shown are necessarily not complete. The new Serbo-Bulgarian, Serbo-Greek, Greco-Bulgarian and Bulgaro-Rumanian boundaries are shown as definite, while the Serbo-Montenegrin, Serbo-Albanian and Albano-Montenegrin are shown as provisional and the new Turco-Bulgarian boundary is not shown at all. For general purposes the maps referred to in foot-note 1 on page 819 of the November *Bull.* (Vol. 45, 1913), in their newest edition, are still the best. Just why one map should have two titles is also not apparent.]

**Germany.** Die Talsperren im Königreich Sachsen. Nach der Karte des Kgl. Sächs. Hydrotechnischen Amtes in der Leipziger Internationalen Bau-fachausstellung 1913 reduziert von Oswald Winkel. 1:500,000. 51½° - 50° N.; 12° - 15° E. 3 colors. Accompanies "Die Talsperren im Königreich Sachsen" by O. Winkel, *Petermanns Mitt.*, Vol. 59, II, 1913, Nov., p. 263.

[Shows sites of 87 dams for industrial purposes, mainly on the Saxon slope of the Erzgebirge, of which 3 are in operation, 4 under construction, 30 in a preliminary stage and the remaining 50 merely projected. The drainage basins of the Weisse Elster, the Mulde, the Elbe and the Spree are shown. The base is an extract from Vogel's map of Germany, 1:500,000.]

**Spain.** Der Lago de San Martin (Castañeda) in der Provinz Zamora (Spanien). Nach eigenen Aufnahmen und Lotungen von Prof. Dr. Wilhelm Halbfass, 1912. 1:10,000. [42°10' N. and 6°45' W.] 6 colors. Accompanies, as Taf. 49, "Der Castañedasee, der grösste Süßwassersee Spaniens, und seine Umgebung" by W. Halbfass, *Petermanns Mitt.*, Vol. 59, II, 1913, Dec., pp. 306-312.

[Original survey, with soundings (isobaths: 10 meter interval), of a small morainic lake just north of the northeastern corner of Portugal.]

## CARTOGRAPHICAL

**World.** (a) Das Deutsche Reich und seine Kolonien: Schiefachsige abstandstreue Zylinderprojektion mit zwei längentreuen Kleinkreisen oder schiefachsige rechteckige Platkarte. Entwurf und Zeichnung von Oswald Winkel, Leipzig. 1:85,000,000. 60° N. - 30° S.; 40° - 170° W. 1 color.

(b) Die beste querachsige-echtzylindrische Abbildung des Atlantischen Ozeans, von Kartograph Oswald Winkel, Leipzig. 1:85,000,000. 85° N. - 54° S.; 120° W. - 50° E.

Accompany, as Taf. 45 and 46, respectively "Beitrag zur Entwicklung schiefachsiger, speziell zylindrischer Projektionen unter Annahme der Kugelgestalt der Erde" by O. Winkel, *Petermanns Mitt.*, Vol. 59, II, 1913, Nov. and Dec., pp. 241-245 and 304-306.

[Suggestions for a more appropriate than the customary representation of large regions whose median line does not coincide with a meridian, as a colonial empire or the Atlantic Ocean, by selecting an oblique cylindrical projection.]

#### ATLASES

**Atlas of Railway Traffic Maps.** By William Arthur Shelton. (One of a series of texts on Interstate Commerce and Railway Traffic.) 21 maps. La Salle Extension University, Chicago (1913). \$3. 12 x 10.

[While primarily of value to railroad traffic managers the maps in this atlas are not devoid of interest to the student of economic geography. The most valuable maps are those showing the freight rates obtaining between various freight association territories (Maps Nos. 3, 4, 9 and 10). These are generally expressed in percentages of the rates in force between two main points, as New York and Chicago. The resulting maps in their complexity of enclaves and exclaves strongly resemble—and possibly for an analogous reason—the territorial kaleidoscope of medieval Europe. The preponderance of economic over political factors is also evident from the dependence of certain regions contiguous to the United States, such as the southernmost part of the Interlake Peninsula of Ontario, which belongs to the Central Freight Association Territory (Map No. 8), and all of Mexico, which forms part of the Southwestern Tariff Committee Territory (Map No. 6). There are, besides, a map showing the freight rates on grain to New York from Illinois, Indiana, Ohio and Lower Michigan, a parcel post map and others. The last five maps, which represent certain of the large railroad systems of the country, are such as are used for advertising purposes in railroad folders. While the topic is preeminently fitting in such an atlas, the inclusion of these distorted and diagrammatic maps with their self-laudatory text is hardly appropriate, especially when such relatively good material as Gray's map (listed under "United States" in *Bull.*, Vol. 44, 1912, p. 155) or Aberle's map is available. The fact that the base maps used in the atlas are, for the greater part, of the crudest wax-engraved type is less the fault of the publisher than of the low standards of the map engraving firm to which they naturally turned inasmuch as it specializes in railroad work. A minor item of make-up may also be noted: In the case of the folded maps the fact that they are attached to their stubs in the middle rather than on the edge (as is done in *Petermanns Mitteilungen*, for instance) will, we believe, soon lead to their wearing through in the center of the map where the creases meet—a matter not entirely unimportant in a book intended for reference and for use as a textbook.]

#### Other Maps Received

##### NORTH AMERICA

##### CANADA

**Western Canada.** Railway Map of Western Canada. [1:1,700,000.] Theodore Seyler, Calgary, Alta., 1913.

Map of Manitoba, Saskatchewan and Alberta, showing the number of quarter-sections available for homestead entry in each township, also the preemption and purchased homestead area as defined by the Dominion Lands Act, 1908. Corrected to May 1, 1913. 35 miles to 1 inch. Railway Lands Branch, [Ottawa].

## UNITED STATES

**Connecticut.** Hammond's New Road Map of Connecticut (Western part), based on the Surveys of the U. S. G. S., U. S. C. & G. S., and the various local surveys, revised and corrected. 1:125,000. C. S. Hammond & Co., New York, 1913. Price 50 cents.

Hammond's New Road Map of Connecticut (Eastern part), based on the Surveys of the U. S. G. S., U. S. C. & G. S., and the various local surveys, revised and corrected. 1:125,000. C. S. Hammond & Co., New York, 1913. Price 50 cents.

**New York.** Hammond's New Road Map of Dutchess and Putnam Counties (New York), based on the Surveys of the U. S. G. S., U. S. C. & G. S., and the various local surveys, revised and corrected. 1 mi. to 1 in. C. S. Hammond & Co., New York.

Indexed Street Map, Greater New York. (Shows all streets in Manhattan, Bronx, Brooklyn, and Queens Boroughs.) Wehman Bros., New York. Price 25 cents.

**New York-New Jersey, etc.** Hammond's Enlarged Road Map of the Country around New York. 2 mi. to 1 in. C. S. Hammond & Co., New York, 1912. Price 50 cents.

## AFRICA

**French Equatorial Africa.** Afrique Équatoriale Française: Congo de Léopoldville à Brazzaville. Plan levé d'Août à Septembre 1911 par la Mission Hydrographique Congo-Oubangui-Sanga sous la direction de M. H. Roussilhe. 1:10,000. [Ministère des Colonies, Paris.]

## ASIA

**China.** Karte von Tschili und Schantung. 1:200,000. Sheets: B11 to B13, C8 to C17, D8 to D17, E9 to E17, F9 to F17, G9 to G17, H9, H10, H14, H17, I 13 to 16, K13, K14, L13, L14. [Names given in Chinese and German characters.] Bearbeitet in der Kartogr. Abteilung der Kgl. Preuss. Landesaufnahme, Berlin, 1907.

## EUROPE

**Austria.** Post-Kurs-Karte von Böhmen. 1:400,000. Inset: Post-Ämter im Stadtgebiete von Krakau. Bezirk der k. k. Post- und Telegraphen-Direktion Prag. Vom Post-Kurs-Bureau des k. k. Handelsministeriums, 1913.

Post-Kurs-Karte der Bukowina. 1:400,000. Inset: Czernowitz. Bezirk der k. k. Post- und Telegraphen-Direktion Czernowitz. Vom Post-Kurs-Bureau des k. k. Handelsministeriums, 1913.

Post-Kurs-Karte von Dalmatien. 1:400,000. Insets: Post-Kurs-Karte von Bosnien u. d. Hercegovina, 1:1,000,000; Zara. Bezirk der k. k. Post- und Telegraphen-Direktion Zara. Vom Post-Kurs-Bureau des k. k. Handelsministeriums, 1913.

Post-Kurs-Karte von Galizien. (Blatt I.) 1:400,000. Inset: Post-Ämter im Stadtgebiete von Krakau. Bezirk der k. k. Post- und Telegraphen-Direktion Lemberg. Vom Post-Kurs-Bureau des k. k. Handelsministeriums, 1913.

Post-Kurs-Karte von Krain und dem Österreichisch-Illyrischen Küstenlande (Triest, Görz und Gradisca, Istrien). 1:400,000. Insets: Post-Ämter im Stadtgebiete von Triest; Laibach. Bezirk der k. k. Post- und Telegraphen-Direktion Triest. Vom Post-Kurs-Bureau des k. k. Handelsministeriums, 1913.

Post-Kurs-Karte von Mähren und Schlesien. 1:400,000. Insets: Brünn; Troppau. Bezirke der k. k. Post- und Telegraphen-Direktion Brünn und Troppau. Vom Post-Kurs-Bureau des k. k. Handelsministeriums, 1913.

Post-Kurs-Karte von Oesterreich unter der Enns. 1:400,000. Inset: Wien. Bezirk der k. k. Post- und Telegraphen-Direktion Wien. Vom Post-Kurs-Bureau des k. k. Handelsministeriums, 1913.

Post-Kurs-Karte von Steiermark und Kärnten. 1:400,000. Insets: [Graz];

[Klagenfurt]. Bezirk der k. k. Post- und Telegraphen-Direktion Graz. Vom Post-Kurs-Bureau des k. k. Handelsministeriums, 1913.

Post-Kurs-Karte von Tirol und Vorarlberg und dem Fürstentume Liechtenstein. 1:400,000. Inset: [Innsbruck and environs]. Bezirk der k. k. Post- und Telegraphen-Direktion Innsbruck. Vom Post-Kurs-Bureau des k. k. Handelsministeriums, 1913.

**Balkan Peninsula.** G. Freytags Karte von Montenegro, mit den angrenzenden Gebieten Österreich-Ungarns, Serbiens und Albaniens. 1:600,000. Verlag der Kartogr. Anstalt G. Freytag & Berndt, Ges. m. b. H., Wien.

[Only new Albano-Montenegrin boundary shown.]

**Denmark.** Illustreteret Skole- og Turistkort over København og Nordsjælland ved Gustav Rosendal. Scale about 1:16,000. Insets: Kort over Københavns Omegn, Kort over Nordsjælland og Øresund. Kommission: Rasmus Hansens Boghandel, Odense. 25 Øre.

**France.** Topo-Guide des principales voies d'accès des massifs du Sulens et du Mont Charvin ou Grand-Carre en Haute-Savoie, dressé par J. Serand et édité avec le concours du Syndicat d'Initiative d'Annecy. 1:50,000. Syndicat d'Initiative, Annecy, 1913. Fr. 0.30.

Topo-Guide des principales voies d'accès du Mont Veyrier (rive droite du Lac d'Annecy), dressé par J. Serand et édité avec le concours du Syndicat d'Initiative. 1:33,333. Syndicat d'Initiative, Annecy, 1913. Fr. 0.30.

**Germany.** Post- und Eisenbahn-Karte des Deutschen Reichs in XX Blättern. 1:450,000. Bearbeitet im Kursbureau des Reichs-Postamts, 1905-1910.

Postleikarten, 1:450,000: 1. Königsberg in Pr., Gumbinnen. 2. Köslin, Danzig, Bromberg (Posen). 3. Breslau, Oppeln (Posen, Liegnitz). 4. Stettin, Potsdam, Berlin (Schwerin, Frankfurt). Inset: Ober-Postdirektionsbezirk Berlin. 5. Dresden, Leipzig, Chemnitz. 6. Kiel, Hamburg, Bremen (Hannover, Schwerin). 7. Minden, Braunschweig, Magdeburg, Cassel, Erfurt. 8. Oldenburg, Münster, Düsseldorf. Inset: Umgegend von Düsseldorf, Elberfeld, Dortmund. 9. Aachen, Köln, Coblenz, Frankfurt. 10. Metz, Strassburg, Karlsruhe, Konstanz. 11. Königreich Bayern—München, Landshut, Regensburg, Augsburg, Nürnberg. Bearbeitet im Kursbureau des Reichs-Postamts, [Berlin], 1913.

Geologische Karte von Preussen und benachbarten Bundesstaaten. 1:25,000. Lieferung 168. Sheets: Krummesse, Schwarzenbek, Nüsse, Siebeneichen, Hamwarde. (Grad-Abteilung 25, Nos. 14, 25, 20, 26 and 31.) Königlich Preussische Geologische Landesanstalt, Berlin, 1911.

**Italy.** Carta Politico-Amministrativa del Regno d'Italia, colle linee ferroviarie e di navigazione. 1:2,000,000. Istituto Geografico Italiano del Dott. G. De Agostini & C., Roma. Lire 1.50.

**Switzerland.** Übersichtskarte über die Kantone St. Gallen und Appenzell. 1:150,000. Geograph. Artist Anst. Kümmerly & Frey, Bern, 1912.

#### WORLD AND LARGER PARTS

**World.** Karte der grossen Postdampfschifflinien im Weltpostverkehr. 1:47,000,000. Insets: Ostchina, 1:6,700,000; Deutsche Schutzgebiete im Stillen Ocean, 1:31,300,000; Nordsee und Kanal, 1:10,800,000; Mittelländisches Meer, 1:18,000,000; Togo und Kamerun, 1:15,000,000; Deutschsüdwest-Afrika, 1:11,200,000; Deutschostafrika, 1:10,000,000. Bearbeitet im Kursbureau des Reichs-Postamts, Berlin. Verlag: Berliner Lithographisches Institut Julius Moser, Berlin, 1907.

#### EDUCATIONAL

**Europe.** Middel-, West- en Zuid-Europa, door P. R. Bos. 1:650,000. J. B. Wolters, Groningen, 1892.

[Excellent physical wall map bringing out relief with great delicacy although perfectly legible at a distance. The best school wall map of Western Europe extant.]